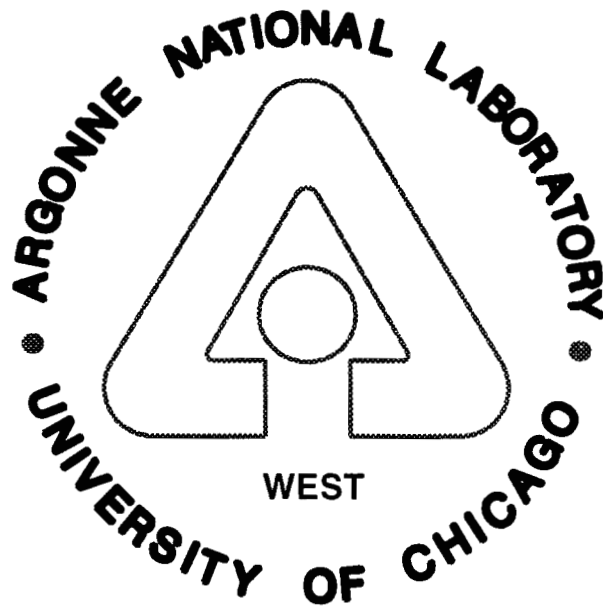


Appendix D

WAG 9

Health and Safety Plan For Argonne National Laboratory-West Remedial Action of Waste Area Group 9 Operable Unit 9-04 at the Idaho National Engineering Laboratory



Prepared By
Argonne National Laboratory-West

WAG 9

Health and Safety Plan For Argonne National Laboratory-West Remediation Activities in OU 9-04 at the Idaho National Engineering Laboratory

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ACRONYMS

ALARA	as low as reasonably achievable
ANL-E	Argonne National Laboratory-East
ANL-W	Argonne National Laboratory-West
ANSI	American National Standards Institute
ARDC	Administrative Record and Document Control
ASTM	American Standard Testing Methods
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of Custody
COCA	Consent Order Compliance Agreement
CRDL	Contract Required Detection Limits
CRQL	Contract Required Quantitation Limits
DDPs	Decision Documentation Packages
DOE	Department of Energy
DOE-CH	Department of Energy, Chicago Operations Office
DOE-ID	Department of Energy, Idaho Operations Office
DQO	Data Quality Objective
EAD	emergency action director
EBR-II	Experimental Breeder Reactor II
EP	Extraction Procedure
EPA	Environmental Protection Agency
ER	Environmental Restoration
ESWM	Environment, Safety and Waste Management
FFA/CO	Federal Facility Agreement and Consent Order
FSP	Field Sampling Plan
HSO	Health and Safety Officer
HSP	Health and Safety Plan
IDLH	immediately dangerous to life and health
IH	industrial hygienist
INEL	Idaho National Engineering Laboratory
INEEL	Idaho National Engineering and Environmental Laboratory
IDHW	Idaho Department of Health and Welfare
IWP	Industrial Waste Pond
JSS	job site supervisor
LDU	Land Disposal Unit
MCTBD	Main Cooling Tower Blowdown Ditch
MDL	Method Detection Limit
MS	Matrix Spike
MSDS	material safety data sheet

NIOSH	National Institute of Safety and Health
NRTS	National Reactor Testing Station
OMP	Occupational Medicine Program
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PPE	personnel protective equipment
PQL	Practical Quantitation Limits
PSG	Program Support Group
PSPs	Preliminary Scoping Packages
QA/QC	Quality Assurance/Quality Control
QAPjP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPD	Relative Percent Difference
RQL	Required Quantitation Limit
RRDL	Required Radiological Detection Limit
RSD	Relative Standard Deviation
RWP	Radiation Work Permit
SOP	Standard Operation Procedures
SOW	Statement of Work
SRPA	Snake River Plain Aquifer
SWMU	Solid Waste Management Unit
SWP	Safe Work Permit
TCLP	Toxicity Characteristic Leaching Procedure
USCG	U. S. Coast Guard
WAG	Waste Area Group
WCC	Warning Communications Center

ABSTRACT

The Record of Decision (ROD) for Argonne National Laboratory-West Waste Area Group 9 (WAG 9) was signed September 29, 1998 by the Department of Energy, Environmental Protection Agency, and the Idaho Department of Health and Welfare. The ROD identified eight sites that posed unacceptable risks to human health and/or the environment. These sites will require some type of remedial action to reduce the exposure of the contaminants to acceptable levels. This health and safety plan established the procedures and requirements that will be used to minimize health and safety risks to persons implementing the remedial action of these sites. This health and safety plan is required by the Occupational Safety and Health Administration (OSHA) standard, 29 Code of Federal Regulations (CFR) 1910.120. It contains information about the hazards involved in performing the tasks, and the specific actions and equipment that will be used to protect persons working at the sites being remediated.

A Safety Analysis Review (SAR) as required by DOE order 5480.23 was previously performed by Scienteck, Inc. of Idaho Falls for the sites being remediated. Maximum contaminant concentrations used to prepare the SAR are within one order of magnitude of those contaminants detected during subsequent sampling. The results of the SAR indicate that the risks for workers in these areas are minimal. This finding was also confirmed during the calculation of the human health and ecological risk assessment performed in the *Comprehensive Remedial Investigation and Feasibility Study for Argonne National Laboratory-West, Operable Unit 9-04* (Comprehensive RI/FS for ANL-W OU 9-04). Copies of these documents will be included in the Administrative Record for the Idaho National Engineering and Environmental Laboratory.

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1. INTRODUCTION

This health and safety plan (HSP) establishes the procedures and requirements that will be used to minimize health and safety risks to person(s) conducting the remedial action at Operable Unit (OU) 9-04 sites. This HSP has been prepared to meet the requirements of the Occupational Safety and Health Administration (OSHA) standard, 29 Code of Federal Regulations (CFR) 1910.120, "Hazardous Waste Operations and Emergency Response." It has been prepared in recognition of and is consistent with the NIOSH/OSHA/USCG/EPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH, 1985); the ANL-W *Environment, Safety and Health Manual*; Department of Energy (DOE), Environmental Restoration Health and Safety Plan Guidelines; and the DOE *Radiological Control Manual*.

This HSP shall govern remedial action activities as defined in Section 3 through 9 of the *Comprehensive Remedial Design/Remedial Action Work Plan for Argonne National Laboratory, Operable Unit 9-04*, employees of ANL-W, subcontractors to ANL-W, and employees of other companies or DOE laboratories. Persons not normally assigned to work at OU 9-04, such as representatives of DOE, the State of Idaho, OSHA, and the Environmental Protection Agency (EPA) shall be considered nonworkers and fall under the definition of occasional site workers as stated in OSHA 29 CFR 1910.120.

This HSP will be reviewed and revised by the subcontracted Health and Safety Officer (HSO) in conjunction with the subcontracted Field Team Leader (FTL) and other Health and Safety professionals as necessary to ensure the effectiveness and suitability of this HSP.

1.1 INEEL Site Description

The Idaho National Engineering and Environmental Laboratory (INEEL) formerly known as the Idaho National Engineering Laboratory (INEL) which was formerly known as the National Reactor Testing Station (NRTS), encompasses 890 square miles, and is located approximately 20 miles west of Idaho Falls, Idaho (Figure 1). The United States Atomic Energy Commission, now DOE, established the NRTS in 1949 as a site for building and testing a variety of nuclear facilities. The INEEL has also been the storage facility of transuranic radionuclides and low-level radioactive waste since 1952. At present, the INEEL supports engineering and operations efforts of DOE and other Federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management technology development, and energy technology and conservation programs. The DOE Chicago Operations Office (DOE-CH) has responsibility for the ANL-W site at the INEEL.

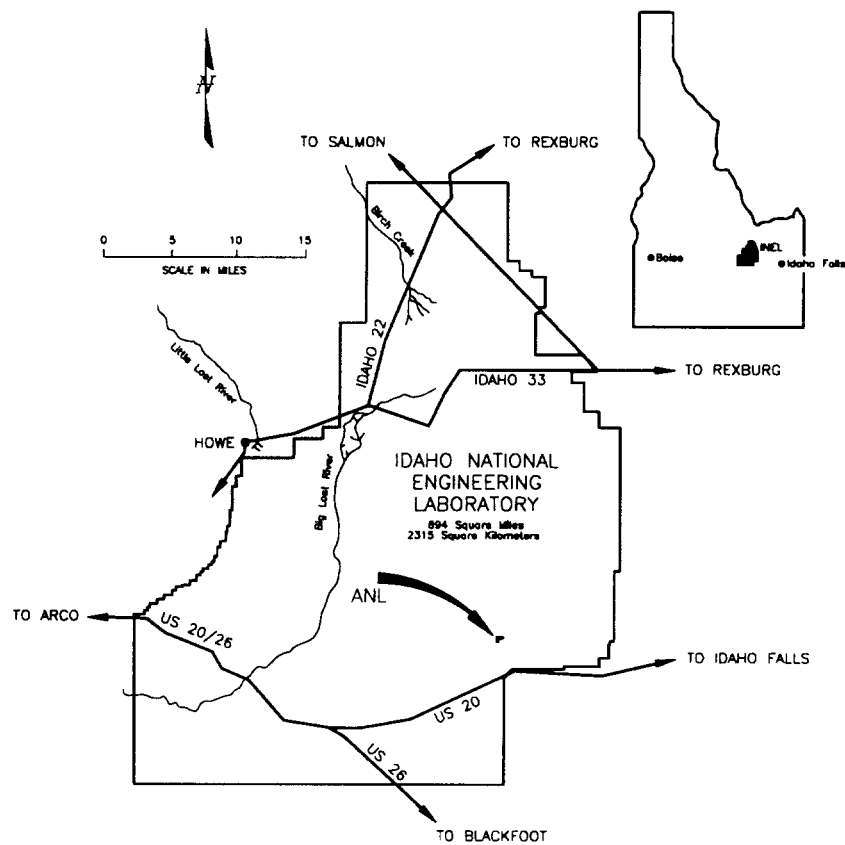


Figure 1 Location of Argonne With Respect to the INEEL and State of Idaho.

1.2 Sites Being Remediated

The Comprehensive RI/FS for ANL-W OU 9-04 evaluated the risks associated with the 37 sites from WAG 9 along with two sites from WAG 10. Together these 39 sites were evaluated to determine the risks to the current and future receptor scenarios. The following two paragraphs explain which sites pose unacceptable risks for the human health and ecological receptors.

Eight areas at ANL-W have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response actions selected in the Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment. These eight areas are; the Industrial Waste Pond (ANL-01), Ditch A (ANL-01), Ditch B (ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Sanitary Sewage Lagoons (ANL-04), the Interceptor Canal-Canal (ANL-09), the Interceptor Canal-Mound (ANL-09), and the Industrial Waste Station Discharge Ditch (ANL-35). These eight areas with unacceptable human health or ecological risks are shown in Figure 2. Sections 1.2.1 through 1.2.8 of this HSP give a summary of the history of the eight sites and the associated contaminants. A summary of the sites with actual or threatened releases of hazardous substances to humans or ecological receptors is shown in Table 1-1. These sites with unacceptable risks to humans and/or the ecological receptors are described in the following two paragraphs, respectfully.

The Baseline Risk Assessment (BRA) indicated that for the current and future occupational scenario, only one contaminant cesium-137, would produce an unacceptable risk to human health. The cesium-137 posed an unacceptable risk to both current and future occupational receptors and future residential receptors at two sites, the Industrial Waste Pond (ANL-01) and the Interceptor Canal-Mound (ANL-09). While the cesium-137 at the Interceptor Canal-Canal (ANL-09) site only poses an unacceptable risks for the current and future occupational receptors. The Interceptor Canal-Canal (ANL-09) risks will be mitigated for the current and future occupational receptors by implementation of the land use restrictions during the 100-year DOE control as defined in the land use assumptions. Thus, the Interceptor Canal-Canal (ANL-09) portion will only undergo implementation of standard operating procedures to reduce the risks to the occupational receptors to acceptable levels.

The results of the WAG 9 ERA indicate that of the 37 WAG 9 release sites and the 2 WAG 10 sites, only six areas produce potentially unacceptable risks for ecological receptors due to the presence of various inorganic contaminants. These six areas are; the Industrial Waste Pond, Ditch A, Ditch B (all from ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Sewage Lagoons

(ANL-04), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). The remaining sites that were evaluated as part of the OU 9-04 Comprehensive RI/FS had risks that were within the acceptable range of the National Contingency Plan and require no action.

Table 1 Sites with unacceptable human health or ecological risks.

ANL-W Area /Site Code	Human Health Risk?	Ecological Risk?
Industrial Waste Pond / (ANL-01)	Yes*	Yes*
Ditch A / (ANL-01)	No	Yes
Ditch B / (ANL-0)	No	Yes
Main Cooling Tower Blowdown Ditch / (ANL-01A)	No	Yes
Sewage Lagoons / (ANL-04)	No	Yes
Interceptor Canal-Canal / (ANL-09)	Yes	No
Interceptor Canal-Mound / (ANL-09)	Yes	No
Industrial Waste Lift Station Discharge Ditch / (ANL-35)	No	Yes

* This is the only site with both human health and ecological risks.

1.2.1 Industrial Waste Pond

The Industrial Waste Pond (ANL-01) is an unlined, approximately 1.2-ha (3-acre) evaporative seepage pond fed by the Interceptor Canal and site drainage ditches. The pond was excavated in 1959, obtained a maximum water depth of about 4 m (13 ft) in 1988, and is still in use today. During this time, the Cooling Tower Blowdown ditches have been rerouted several times. ANL-W auxiliary cooling tower blowdown ditches convey industrial wastewater from the EBR-II Power Plant and the Fire Station (Bldgs. 768 and 759) to the Industrial Waste Pond. The Industrial Waste Pond was originally included with the Main Cooling Tower Blowdown Ditch (ANL-01A) as a Land Disposal Unit under the RCRA Consent Order and Compliance Agreement on the basis of potentially corrosive liquid wastes discharged with the cooling tower effluent. However, ANL-W conducted a field demonstration with the EPA and State of Idaho representatives in attendance in July 1988 that showed that any potentially corrosive

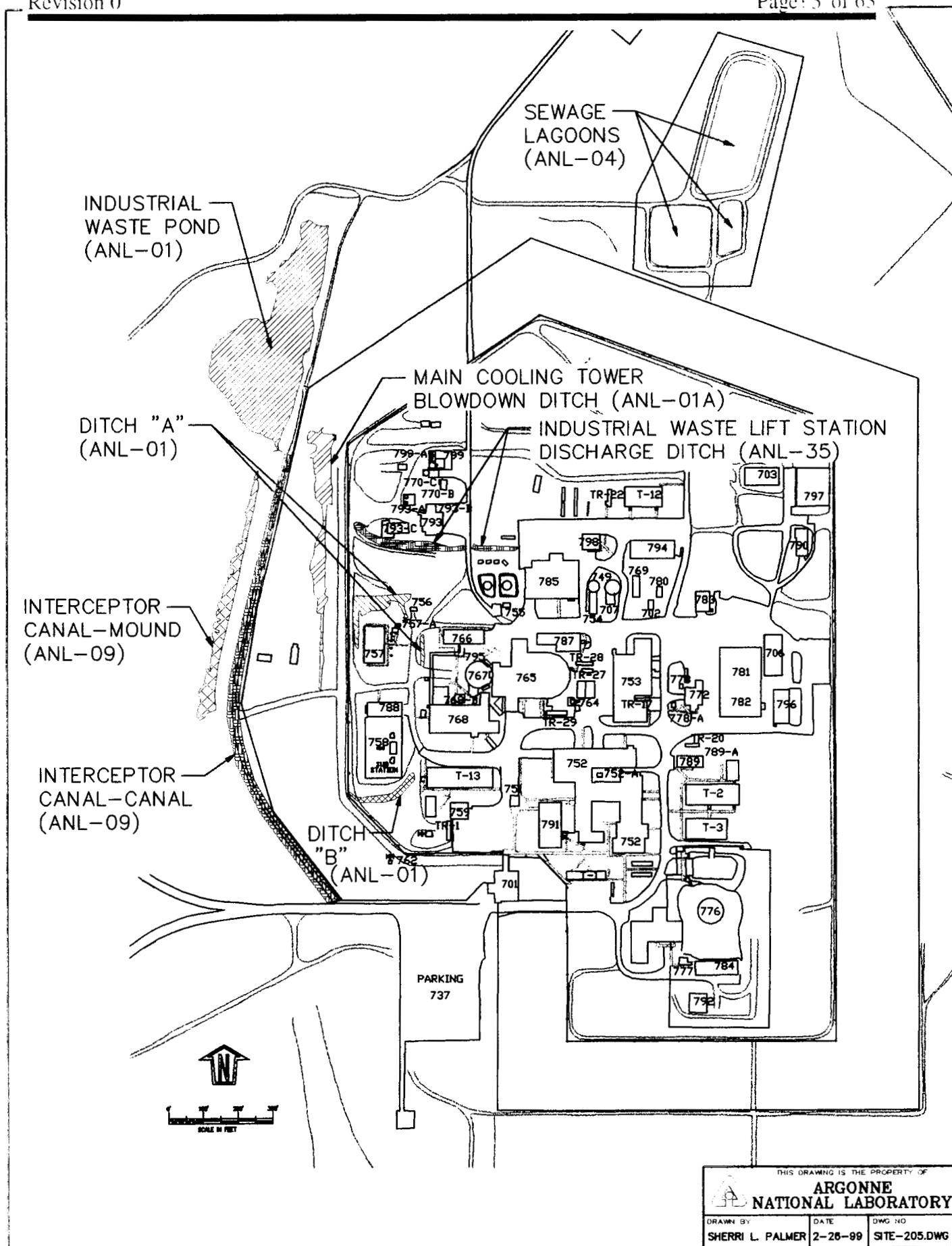


Figure 2 Eight Areas at ANL-W with Unacceptable Human Health or Ecological Risks.

wastes discharged to the Industrial Waste Pond were naturally neutralized in the Main Cooling Tower Blowdown Ditch before reaching the Industrial Waste Pond. On that basis, EPA removed the Industrial Waste Pond as a Land Disposal Unit and re-designated it as a Solid Waste Management Unit. Therefore, this site is still under the regulatory authority of RCRA in addition to being on the FFA/CO and under the regulatory authority of CERCLA.

DOE anticipates that the Industrial Waste Pond will continue to be used for storm water disposal as well as future releases of liquid cooling water discharges from the Sodium Process Facility. The Sodium Process Facility cooling water discharges will average 100 gallons per minute and are anticipated to last for three years starting in the spring of 1998 and lasting until summer of 2003. These cooling water releases will be discharged to the surface drainage ditch on the North side of ANL-W and drain approximately 250 ft. west to the Industrial Waste Pond. The Sodium Process Facility is a permitted HWMA/RCRA facility and is scheduled for clean closure under RCRA.

Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map and the statistics for contaminant of concern (COC) by pathway for all samples collected from the Industrial Waste Pond. Soil and sediment samples were collected from the Industrial Waste Pond as part of four different investigations occurring from 1986 to 1994. Cesium-137 was retained as a COPC for humans while, four inorganic contaminants were retained as COPCs for the ecological receptors.

The cesium-137 and the four inorganics (trivalent chromium, mercury, selenium, and zinc) were present in the southern and eastern part of the Industrial Waste Pond with concentrations typically greatest for surface samples near the inlet pipe in the southern part of the Industrial Waste Pond. Samples were screened against the 95% UCL concentrations for grab samples at the INEEL and will be referred to as 95% UCL background. The highest number of metals above the 95% UCL background concentration were collected from location #101 with 11 metals exceeding background, then location # 97 with ten metals exceeding the 95% UCL background concentration. The maximum cesium-137 concentration was 57.91 pCi/g, while the 95% UCL concentration was 29.2 pCi/g. For the trivalent chromium, mercury, selenium, and zinc the maximum concentrations were 11,400, 6.8, 37.9, and 5,850 mg/kg and the UCL values were 1,30, 2.62, 8.41, and 8.41 mg/kg, respectively. Therefore, the horizontal extent of contamination

is the dimensions of both the southern and eastern part of the Industrial Waste Pond 200 feet wide and 250 feet long, while the vertical extent of contamination is in the upper 0.5 feet of sediments in the Industrial Waste Pond.

1.2.2 Ditch A

Ditch A conveyed industrial wastewater from the EBR-II Power Plant auxiliary cooling tower to the Industrial Waste Pond. Ditch A is still being used today to transport storm water runoff as well as intermittent auxiliary cooling tower waters. Discharges to Ditch A flow into the Main Cooling Tower Blowdown Ditch and ultimately into the Industrial Waste Pond.

Soil samples were collected from Ditch A as part of two different investigations. These studies are the Chen Northern in 1988 and the 1994 ANL-W study. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway. In the 1988 Chen Northern study, eight soil samples were collected from three locations in the western part of the ditch. In the 1994 ANL-W study, 30 soil samples were collected from 11 locations throughout the entire length of the ditch.

Mercury was retained as a COPC for ecological receptors and was detected in 74% (27/38) of the samples analyzed. All of the mercury detections exceeded the upper limit of the 95% UCL background concentration (0.074 mg/kg). The source of the mercury is most likely from mercuric chloride used as a wood preservative in the cooling tower or from a neutron absorber in the power plant which is being decommissioned. The maximum detected concentration of 4.1 mg/kg was detected at location #10W in the surface sample (0 to 6 inches). While, the UCL concentration for mercury in Ditch A was 3.94 mg/kg. In all but one instance, the surface samples at each location contained the highest concentrations of mercury with the exception of #26E. The mercury contamination in Ditch A is spread through the entire length with the highest concentrations near the intersection of the Main Cooling Tower Blowdown Ditch and Ditch A. The mercury concentrations also decrease with increasing depth with the highest concentrations in the surface 0 to 6 inch samples. Therefore, the extent of contamination is the dimensions of both the eastern and western part of Ditch A 5 feet wide and 400 feet long and the vertical extent contained to the surface soils 0 to 6 inches.

1.2.3 Ditch B

Ditch B was also used to transport storm water runoff as well as wastewater from the EBR-II Power Plant and the Fire Station (Bldgs. 768 and 759) to the Industrial Waste Pond. Only a small 125 feet portion of Ditch B is still being used today since the majority 1,275 feet of Ditch B was backfilled with clean soil to grade approximately 5-feet during the installation of a secondary security fence.

Soil samples were collected from Ditch B as part of three different investigations. Six soil samples were collected from the 1988 DOE study, 15 samples collected from the 1988 Chen-Northern study, and 10 samples in the 1994 ANL-W study. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for the 1994 samples collected from Ditch B. The contaminant screening resulted in COPCs for humans and only two inorganics being retained as COPCs for the ecological receptors. These two inorganics are trivalent chromium and zinc. The extent of the inorganic contaminants are discussed below.

The contaminants in the covered portion of Ditch B have been screened from the risk assessment since the pathway was eliminated when the area was backfilled with clean soils. The open portion of Ditch B has chromium and zinc at concentrations that could pose unacceptable human and ecological risks. The maximum concentration of trivalent chromium and zinc are 4,530 and 3,020 mg/kg and the UCL concentrations are 1,306 and 1,460 mg/kg, respectively. The extent of the inorganic contaminants span the entire length of the open portion of Ditch B is 5 feet wide and 125 feet long. No stratification of inorganics was determined from the results in that portion of Ditch B and thus the total depth of the alluvium to the basalt of 0 to 1.3 feet is used to define the extent of contamination.

1.2.4 Main Cooling Tower Blowdown Ditch

The Main Cooling Tower Blowdown Ditch (ANL-01A) runs north on the westside of the Main Cooling Tower and then north between the security fences to the Industrial Waste Pond. It is an unlined channel approximately 700 feet in length and 3 to 15 feet wide. From 1962 to 1996, the ditch had been utilized to convey industrial wastewater from the Cooling Tower to the Industrial Waste Pond. The main source of

impurities to the Industrial Waste Pond were water treatment chemicals used for the regeneration of backwash waters from the ion exchange resin beds and remove minerals from cooling tower water used in the EBR-II steam system. From 1962 to July 1980, a chromate-based corrosion inhibitor was added to the Cooling Tower water and the blowdown contained significant quantities of hexavalent chromium. Ion exchange column regeneration discharges have occurred from 1962 to March 1986. Regeneration of these column is accomplished with sulfuric acid for cation columns and sodium hydroxide for anion columns.

In January 1986, a pH measurement of 1.86 was measured in the effluent discharged to the Main Cooling Tower Blowdown Ditch. This classified the liquid wastes as corrosive according to 40 CFR 261.22. The site was then classified as a Land Disposal Unit under RCRA. A temporary neutralization system was installed in March, and a permanent neutralization tank was installed in October 1986. A few discharges of regeneration water occurred, but they were in small batches and were monitored before discharge. Since October 1986, after the neutralization tank was installed, reagents are being neutralized in a tank prior to discharge to the ditch. DOE, along with EPA and IDHW WAG 9 managers, have determined that the Main Cooling Tower Blowdown Ditch is a RCRA Land Disposal Unit and will be remediated under the CERCLA process in accordance with the applicable substantive requirements of RCRA/Hazardous Waste Management Act (HWMA), if an unacceptable risk to human health or the environment. However, the FFA/CO has only adopted RCRA corrective action (3004 (u) & (v)), and not RCRA/HWMA closure. Therefore, upon completion of the remedial action, the DOE must receive approval from the IDHW Department of Environmental Quality director that the Main Cooling Tower Blowdown Ditch has been closed pursuant to RCRA/HWMA closure requirements.

Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for samples collected from the Main Cooling Tower Blowdown Ditch. Soil samples were collected from the Main Cooling Tower Blowdown Ditch as part of four different investigations occurring from 1987 to 1994. In 1987, one soil sample (EST-SED) was collected from the northern part of the ditch where a storm water discharge ditch flows into it. In 1988, four soil samples were collected from the different parts of the ditch. Three soil samples were collected from the west part of the ditch (C103B-S, C100B-S,D, and C73A-S),

one sample was collected in the eastern portion of the ditch at the discharge point (B6B-S,D). In 1989, two soil samples (M-8 and M-10) were collected in the 145-foot interbed along the western portion of the ditch. Finally, in 1994, 35 samples were collected along the entire length of the ditch. The contaminant screening resulted in two inorganics; trivalent chromium and mercury at levels high enough be retained as a COPC for the ecological receptors.

Chromium concentrations were the highest in the outfall from the Cooling Tower. But, the entire length of the Main Cooling Tower Blowdown Ditch has concentrations of chromium above the 95% UCL background concentration levels for the INEEL surface soils. The analysis performed on the chromium was for the total chromium analysis. The chromium was release was almost exclusively in the trivalent form rather than the more toxic hexavalent form. However, to be conservative, DOE assumed that ten percent of the total chromium would be in the more toxic hexavalent form. The chromium concentrations almost exclusively decreased with increasing depth, and also decreased with increasing distance downstream of the cooling tower outfall. The maximum chromium concentration was 2,200 mg/kg and the UCL concentration was 1,306 mg/kg for the Main Cooling Tower Blowdown Ditch.

Forty-eight percent (22/46) of the mercury concentrations exceeded the upper limit of the 95% UCL background concentration (0.074 mg/kg) ranging from 0.08–13.4 mg/kg. The highest detected concentration was from the surface sample at location 9E. Mercury concentrations were highest in the eastern part of the ditch and typically decreased to less than one mg/kg in the subsurface samples except for one location. At location 11E, mercury concentrations were 2.8 mg/kg in the surface and 2.3 mg/kg in the subsurface sample. The maximum mercury concentration was 13.4 mg/kg and the UCL concentration was 8.83 mg/kg for the surface soils in the Main Cooling Tower Blowdown Ditch.

The extent of the contamination is mainly concentrated in the southern portion of the ditch near the cooling tower outfall. However, there are some concentrations greater than the upper limit of the 95% UCL background concentration for some metals in the northwestern part of the ditch. Therefore, the horizontal extent of contamination is the dimensions of both the eastern and western part of the Main Cooling Tower Blowdown Ditch 3 to 15 feet wide and 700 feet long. Because the width of the ditch varies from 3 to 15 feet, an average width of 6

feet will be used. The majority of the inorganic contaminants were concentrated in the top 6 inches of soils. However, some detections greater than the upper limit of the 95% UCL background concentration were made in some subsurface samples. Therefore, the vertical extent of contamination is assumed to be one-half the average depth to basalt 2 feet.

1.2.5 Sewage Lagoons

The sanitary Sewage Lagoons (ANL-04) are located at the Sanitary Sewage Treatment Facility, north of the ANL-W facility. Two lagoons were constructed in 1965, with a third built later in 1974. According to engineering drawings, the three sanitary sewage lagoons cover approximately two acres. Appendix B shows a figure of the three lagoons with dimensions of; (1) $150 \times 150 \times 7$ feet, (2) $50 \times 100 \times 7$ feet, and (3) $125 \times 400 \times 7$ feet. The lagoons receive all sanitary waste waters originating at ANL-W, with the exception of the Transient Reactor Test Facility, Sodium Process Facility, and the Sodium Components Maintenance Shop. Sanitary waste discharged is from rest rooms, change facilities, drinking fountains, and the Cafeteria. The three lagoon bottoms are sealed with a 0.125 to 0.25-inch layer of bentonite and are situated approximately 640 feet above the groundwater. The Sewage Lagoons are still in use and will continue to be used for disposal of sanitary wastes for the next 35 years.

Between 1975 and 1981, photo processing solutions were discharged from the Fuel Assembly and Storage Building to the Sanitary Waste Lift Station, which discharges to the Sewage Lagoons. There has been no known radioactive or hazardous substances released into the Sewage Lagoons. Periodic sampling of the Sewage Lagoon and the radionuclide detector placed in the lift station (Sanitary Waste Lift Station-788) supplying the Sewage Lagoons document that no radioactive substances have been released.

The results of the contaminant screening indicated that one contaminant, mercury, should be retained as a COPC for the ecological receptors. The mercury concentrations were detected throughout all of the sludge 0 to 6 inch samples in the Sanitary Lagoons. The maximum mercury concentration in the Sewage Lagoons was 3.2 mg/kg and this value was used in place of the UCL concentration because of the small data set (eight samples).

1.2.6 Interceptor Canal-Canal

The canal portion was utilized to transport industrial waste to the Industrial Waste Pond and to divert spring runoff and other natural waters around the ANL-W facility for flood control. Between 1962 and 1975, two 4-in. pipes transported liquid industrial wastes and cooling tower effluent, to the Interceptor Canal. One line transported cooling tower blowdown water and regeneration effluent while the other line originated at the Industrial Waste Lift Station (Bldg. 760) and transported industrial wastes. Liquid radioactive wastes were discharged through the same line as the industrial wastes, but they were diverted to the EBR-II Leach Pit. Discharge of industrial wastes was discontinued in 1973, and discharge of cooling tower blowdown water was discontinued in 1975.

During clean out operations at the Interceptor Canal in October 1969, abnormal background radioactivity was detected. Additional radiation surveys in 1969, 1973, and 1975 indicated that the entire length of the Interceptor Canal was contaminated. Approximately 4,540 yd³ of contaminated soil was identified and only 1,240 yd³ was targeted for removal. Of this soil that was removed, approximately 182 yd³ was disposed at the RWMC from 1975 to 1976, and remaining 1,058 yd³ of contaminated soil was removed and stockpiled on site (this stockpiled soil was evaluated as part of the OU 10-06). The remaining soil, 3,300 yd³ was left in the ANL-09-Mound and was investigated as part of the RI/FS process. Another survey conducted in 1993 indicated that two small areas had elevated readings above background.

The contaminant screening resulted in only cesium-137 being retained as a COPC for humans and no COPCs for the ecological receptors. The 95% UCL concentration for cesium-137 is 18 pCi/g and is fairly uniform throughout the entire length of the ditch. Thus, the extent of contamination is 30 x 1,425 x 6 feet.

1.2.7 Interceptor Canal-Mound

This section summarizes the analytical results for soil samples collected at the Interceptor Canal-Mound (ANL-09) area. The Interceptor Canal-Mound was formed when 1,384 m³ (1,810 yd³) of dredged material was placed on the bank of the Interceptor Canal. Soil samples from the Interceptor Canal Mound were only analyzed for radionuclides. Inorganic releases to the Interceptor Canal-Canal occurred after the canal was dredged and therefore would not be in the dredged piles.

Surface soil samples 0 to 6 inches and a subsurface soil sample approximately 3 to 4 feet were collected at the ANL-09-Mound area. In addition, another subsurface soil sample was collected from approximately 5 to 6 feet at three sample locations (#356, #368, and #378). Subsurface soil samples were collected at a depth that corresponds to the bottom of the mound. The deeper subsurface samples were collected to determine if migration of contaminants has occurred. The contaminant screening resulted in only one radionuclide (cesium-137) being retained as a COPC for humans and no COPCs for ecological receptors.

The cesium-137 was detected at every sample location throughout the mound, with the highest detected concentration (52 pCi/g) at location M19. While the UCL concentration for the cesium-137 was 30.53 pCi/g. Therefore, the horizontal extent of the cesium-137 is defined as the entire length of the mound 500×20 feet. For the vertical extent of the cesium-137 contamination, there is a significant decrease in concentrations (approximately one order of magnitude) between the surface and subsurface samples. The maximum detected C-137 concentration in the subsurface sample was only 5.9 pCi/g. Nevertheless, as this concentration is above the established background, the vertical extent of contamination will be 4 feet.

1.2.8 Industrial Waste Discharge Ditch

The Industrial Waste Lift Station Discharge Ditch (ANL-35), also known as the North Ditch, is located inside the ANL-W security fences. The ditch is approximately 500 feet in length with a bottom width of 3 to 4 feet. At any one time, there is approximately 2 to 3 inches of water in the ditch. The ditch receives industrial waste water, primarily cooling water and photo processing wastes (e.g., photo developers, fixers, and stabilizers, and acids), but also including several retention tank overflows that may contain ethanol, sodium hydroxide, and some radionuclides, from a variety of facilities at ANL-W. The ongoing and future discharges of these processing wastes are regulated under other EPA laws such as RCRA. The cleanup action specified in this ROD address only those past releases of these processing wastes.

Soil samples were collected from this site on three separate occasions. Three soil samples were collected during the 1989, DOE Survey, 17 soil samples were collected during the 1988 Chen Northern sampling, and an additional 19 soil samples were collected in 1994 by ANL-W. Soil samples from all three sampling efforts were collected and

analyzed for organics, inorganics, radionuclides, and dioxin/furans. Appendix A of the OU 9-04 Comprehensive RI/FS shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway for all samples collected in 1994 from the Industrial Waste Lift Station Discharge Ditch. Sample collection depths for the 1994 study were 0 to 6 inches and 1.5 to 2 feet.

The results of the contaminant screening resulted in no COPCs for human and only one inorganic, silver being retained as a COPC for the ecological receptors. Silver was analyzed for in all three studies and was detected at 87% (33 of 39) of the sample locations with the highest detection (352 mg/kg) at #41. This sample location is located in the middle of the ditch. The maximum concentration was used in risk assessment as the UCL value because of the small data set and large standard deviation in the data. However, high concentrations were also detected at other locations grid 18, ND03, 15, 18, and 19. Therefore, the horizontal extent of contamination is defined as the entire length of the ditch. No trends on the vertical extent of contamination were detected for silver. Thus, the average soil depth on top of the basalt 1.0 foot was used to define the vertical extent of contamination. Thus, the extent of contamination at the Industrial Waste Lift Station Discharge Ditch is defined as 15 × 500 × 1 foot.

1.3 Scope of Work

The scope of work includes the excavation and on-INEEL disposal of soils in Ditch B and the eastern segment of the Main Cooling Tower Blowdown Ditch. The Ditch A, Main Cooling Tower Blowdown Ditch -West segment, Industrial Waste Ditch, and the Interceptor Canal-Mound sites will undergo a two year field test for phytoremediation. The remediation of the Industrial Waste Pond and the Sewage Lagoons are estimated to be initiated in 2003 and 2035, respectively. The Interceptor Canal-Canal site will only require institutional controls for the next 100 years to meet the remediation goals identified in the ROD.

Because of the type of work, associated hazards, and workers completing the excavation and on-INEEL disposal for Ditch B and the Eastern portion of the Main Cooling Tower Blowdown Ditch are similar, the work activities to complete both are listed in Section 1.3.1. Likewise, the work activities necessary for the implementation of phytoremediation at the Ditch A, Main Cooling Tower Blowdown Ditch -West segment, Industrial Waste Ditch, and the Interceptor Canal-Mound are similar and shown in Section 1.3.2.

1.3.1 Excavation with on-INEEL Disposal Activities

The following work activities are necessary for completion of the excavation with on-INEEL disposal for Ditch B and the East portion of the Main Cooling Tower Blowdown Ditch:

- Mobilization of equipment
 - Materials Services personnel will use heavy equipment (i.e., backhoe, payloader, dump trucks) to excavate the soil in Ditch B and the East portion of the Main Cooling Tower Blowdown Ditch to the top of basalt
 - The Plant Services personnel will use shovels, trowels, and brooms to remove the soil near the culverts and in the uneven surfaces of the top of basalt.
 - The excavated soils will be placed in dump trucks, covered with tarps, and hauled to the Central Facilities Area Landfill Complex for disposal
 - After the excavation activities are completed Visual Media Services personnel will take photographs of the sites for verification that the removal activity has been completed
 - Material Services personnel will reconstruct the drainage ditches using clean fill material hauled in from the borrow pit.
 - Final material grading around culverts will be conducted by Plant Services personnel
 - Standard dust control measures (water spray, stop work during winds greater than 25 mph, etc.) will be employed during all earthwork activities
 - Safety barriers consisting of yellow and black rope on standards will be placed around the sites during the remediation effort. For open excavations near roads, barricades with warning beacons are necessary. Signs warning the individuals of a CERCLA site will be attached to the rope approximately every 50 feet around the site
 - All equipment used during the excavation activities will be deconed at the stationary decon pad located East of the Cooling Tower
 - Project generated waste streams will be disposed of per outcome of hazardous waste determination for the waste stream
 - Demobilization of the equipment will occur at the end of the excavation with on-INEEL disposal remedial action.
-

1.3.2 Phytoremediation Activities

A brief summary of the work activities necessary for phytoremediation of three sites (Ditch A, West portion of the Main Cooling Tower Blowdown Ditch, Interceptor Canal-Mound, and the Industrial Waste Lift Station Discharge Ditch) at ANL-W:

- Purchase and or lease equipment necessary for implementation of the phytoremediation project
 - Mobilization of the equipment to the ANL-W site
 - Utilizing heavy equipment to the maximum extent possible to remove living and dead plants
 - Use of heavy equipment to regrade the areas in accordance with design drawings
 - Installation of fence posts with warning signs approximately every 50 feet around the outside of each of these site
 - Installation of automated irrigation system with moisture detectors integrated with a weather station for optimized control and data recordability for each site
 - Manual removal of the larger cobbles and rocks from each of the three sites
 - Using a heavy duty soil roto-tiller mounted on a tractor to prepare the seed beds prior to planting
 - Using a commercial spreader with pneumatic tires to apply the koshia seeds to the Interceptor Canal- Mound site
 - Dragging a log chain after application of the koshia seeds to agitate the soil and partially cover the seeds
 - Using the walk behind cycle mower to cut the koshia plants approximately two inches above grade prior to them going to seed
 - After drying, use a pull behind rake mounted on a tractor to create windrows of the koshia plants
 - Use a bailer pulled behind a large tractor to bail the koahia plants into small rectangular bales (20x18x40 inches)
-

- Use small trailer to pickup the bails and haul them inside the ANL-W facility and stage them in a cargo container designated for Low Level Waste Storage
- After analytical results are returned and the appropriate RRWAC waste forms are completed and approved by the site managing contractor the shipment of the full cargo container can be initiated
- Using the small bucket on the backhoe to cut a hole approximately 12 inches deep and 18 inches apart into the soil in Ditch A, the East Portion of the Main Cooling Tower Blowdown Ditch, and the Industrial Waste Lift Station Discharge Ditch
- Manual placement of the bare root stock willow seedlings in holes created by the backhoe and backfilling the plants with soil in Ditch A, the East Portion of the Main Cooling Tower Blowdown Ditch, and the Industrial Waste Lift Station Discharge Ditch
- After two growing seasons, the willow trees will be removed by using a grappler attached to either the backhoe or front end loader to remove as much of the roots as well as the above ground trunk
- All removed portions of the willow trees will be chipped into smaller pieces by using a commercially available wood chipper
- The discharge chute of the chipper will be directed into a 4x4x6 foot compactable box and prepared for shipment to WERF in accordance with the section 4.5 (low level waste) of the RRWAC

2. OU 9-04 Remedial Action Responsibilities

The key personnel required to perform the remedial action of the OU 9-04 sites are listed in sections 2.1.1 through 2.1.15. Job tasks and lines of communication are also discussed in the sections.

2.1 Personnel

The organizational structure for HSP reflects the resources and expertise required to perform the task, while minimizing risks to worker health and safety. Figure 3 shows the names of the individuals who will be filling the key roles at OU 9-04, and lines of responsibility and communication are shown on the organizational chart. The following subsections outline responsibilities of key site personnel.

2.1.1 ANL-W Environmental and Waste Management Project Manager

The ANL-W Environmental and Waste Management Project (EWMP) Manager has ultimate responsibility for the technical quality of all projects and safety of personnel during field activities performed by or for the EWMP. The EWMP Manager provides technical coordination and interfaces with the DOE-CH, and the Department of Energy Idaho Operations Office (DOE-ID) Environmental Support Offices. The EWMP Manager ensures that:

- All activities are conducted in accordance with DOE, EPA Region 10, and State of Idaho requirements and agreements
- Monitors and approves program budgets and schedules
- Ensures the availability of necessary personnel, equipment, subcontractors, and services
- Provides direction for the development of tasks, evaluation of findings, development of conclusions and recommendations, and production of reports.

2.1.2 ANL-W CERCLA Project Manager

The CERCLA project manager has the responsibility for ensuring that all activities conducted during the project are in compliance with all applicable OSHA, EPA, DOE, Department of Transportation (DOT), and State of Idaho requirements. The CERCLA project manager is responsible for ensuring that tasks comply with the OU 9-04 remedial action quality assurance project plan, this HSP, and sampling and analysis plan. The project manager coordinates all field, laboratory, and modeling activities and State of Idaho requirements.

2.1.3 ANL-E Phytoremediation Researchers

ANL-W has retained phytoremediation expertise from ANL-E researchers. The researchers bring a wealth of experience to the project team and have been involved in numerous phytoremediation projects in United States and abroad. The researchers will make the final determination when nutrients, extractants, and harvesting activities will be completed.

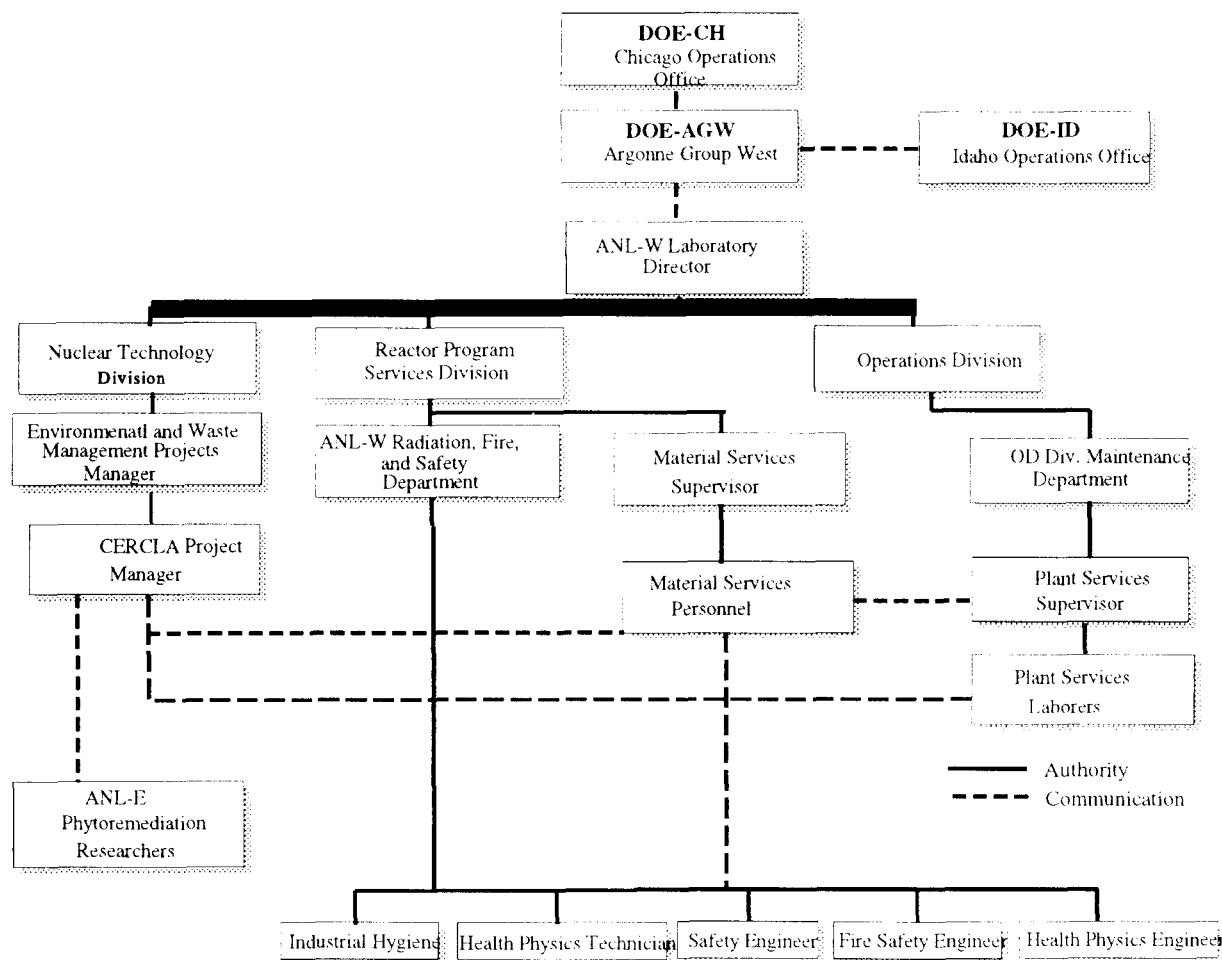


Figure 3 Organizational Structure for OU 9-04 Remedial Action.

2.1.4 ANL-W Plant Services Laborer Supervisor

ANL-W Plant Services Laborer Supervisor will schedule and assign laborers to complete tasks deemed necessary by the CERCLA Project Manager. The Laborer Supervisor will be responsible for producing manpower estimates of the number of man-hour necessary to complete the assigned tasks and tracking actual man-hours worked on this phytoremediation project.

2.1.5 ANL-W Plant Services Laborers

The Plant Services Laborers will report the Plant Services Laborers Supervisor and be responsible for performing the assigned tasks. The laborers will typically be assigned tasks such as manual shoveling of soils, rock removal, plant removal, planting of koshia and willows, cutting of the koshia, hauling the bales of koshia, and chipping of the willows. Other tasks may be added to this project during refinement and optimization of the phytoremediation process.

2.1.6 ANL-W Materials Services Supervisor

ANL-W Material Services Laborer Supervisor will schedule and assign laborers to complete tasks deemed necessary by the CERCLA Project Manager. The Material Services Supervisor will be responsible for producing manpower estimates of the number of man-hour necessary to complete the assigned tasks and tracking actual man-hours worked on this phytoremediation project.

2.1.7 ANL-W Material Services Personnel

The ANL-W Material Services personnel report to the Material Services Supervisor. The Supervisor will assign job assignments and personnel to perform the tasks. The typical tasks performed by the Material Services personnel include those activities that require large equipment to perform. These tasks include operating equipment to perform the grading activities, use of the front end loader, back-hoe operation, driving of the dump truck, operating the pay loader, and operation of the tractor with the ripper, plow, roto-tiller, rake, and bailer.

2.1.8 Nonworkers

All persons who may perform work in OU 9-04 that are not a part of the field team at the project site are considered nonworkers for the purposes of this project. A person shall be considered to be "on site" when they are present in or beyond the designated support zone. Nonworkers will be deemed occasional site workers per 29 CFR 1910.120, and must meet minimum training requirements for such workers as described in the OSHA standard, and any additional task specific training that is specified in Section 3.

All nonworkers, including ANL-W employees from other departments, INEEL employees, and representatives of DOE, or State or Federal regulatory agencies, may not proceed beyond the support zone without receiving site-specific training, signing a site-specific training acknowledgment form, receiving a safety briefing, wearing the appropriate protective equipment, and providing proof of meeting the training requirements specified in Section 4 of this HSP. Nonworkers will be escorted by a fully trained OU 9-04 representative or a designated alternate at all times while on the site.

2.1.9 Other Site Visitors

A casual visitor to the site is a person who does not have a specific task to perform or other official business to conduct at the site. Casual visitors to the site are not permitted to be in the area of the investigation work.

2.1.10 Health and Safety Officer

The HSO is the person who is responsible for health and safety issues for all employees working at OU 9-04 sites. The HSO advises the CERCLA Project manager on all aspects of health and safety, and is authorized to stop work at the site if any operation threatens worker or public health or safety. The HSO may be a double duty employee who fulfill two positions listed in this HSP. The HSO has other specific responsibilities as stated in other sections of this HSP. The HSO is supported by the ANL-W Safety Engineer (SE), ANL-W Fire Engineer (FE), ANL-W IH, ANL-W Health Physics Engineer (HPE), and ANL-W Health Physics Technician (HPT).

If it is necessary for the HSO to leave the site, an alternate individual will be appointed by the HSO to fulfill this role, and the identity of the acting HSO will be recorded in the logbook.

2.1.11 ANL-W Industrial Hygienist

The ANL-W IH is the primary source of information regarding nonradiological hazardous and toxic agents at the OU 9-04 sites. The ANL-W IH assesses the potential for worker exposures to hazardous agents in accordance with the ANL-W *Environment, Safety and Health Manual*. The ANL-W IH recommends appropriate hazard controls for protection of all personnel involved in the project. The ANL-W IH, reviews the effectiveness of monitoring and personal protective equipment (PPE) required in this HSP, and recommends changes as appropriate. Employees showing health effects resulting from possible exposure to hazardous agents will be referred to the Occupational Medicine Program (OMP) by the ANL-W IH or the HSO. The ANL-W IH may have other duties as specified in other sections of this HSP, or in appropriate company procedures and manuals.

2.1.12 ANL-W Safety Engineer

The ANL-W safety engineer reviews work packages, observes site activity, assesses compliance with ANL-W *Environment, Safety and Health Manual*, and advises the subcontractor on required safety equipment, and recommends solutions to industrial safety issues that arise. The ANL-W safety engineer may also perform air monitoring to determine the presence of combustible mixtures of gases or potential low-oxygen atmospheres. The ANL-W safety engineer may have other duties as specified in other sections of this HSP, or in Company procedures and manuals.

2.1.13 ANL-W Health Physics Technician

The ANL-W HPT is the primary source of information and guidance on radiological hazards. The ANL-W HPT will be informed of daily activities in the remediation of the 9-04 sites during any task operations when a radiological hazard to operations personnel may exist or is anticipated. Responsibilities of the ANL-W HPT include radiological surveying of equipment used in and personnel working in the remediation sites as well as providing guidance for radiological decontamination of equipment and personnel; and accompanying the affected personnel to the nearest INEEL medical facility for evaluation if significant radiological contamination occurs. The ANL-W HPT must notify the CERCLA Project Manager of any radiological occurrence that must be reported. The ANL-W HPT may have other

duties as specified in other sections of this HSP, or in Company procedures and manuals.

2.1.14 ANL-W Health Physics Engineer

The ANL-W Health Physics Engineer (HPE) is the primary source of information and guidance relative to the evaluation and control of radioactive hazards at ANL-W. The radiological engineer makes recommendations to minimize health and safety risks of task operations personnel if a radiological hazard exists or occurs during phytoremediation. Responsibilities of the ANL-W HPE include performing radiation exposure estimates and as low as reasonably achievable (ALARA) evaluations; identifying the type(s) of radiological monitoring equipment necessary for the task; advising the CERCLA Project Manager, and ANL-W HPT of changes in monitoring or PPE. The ANL-W HPE may also have other duties to perform as specified in other sections of this HSP, or in Company procedures and manuals.

2.1.15 Occupational Medicine Program

The INEEL OMP provides medical surveillance for personnel assigned as hazardous waste site workers per the 29 CFR 1910.120 (HAZWOPER) OSHA standard. The OMP is also responsible for evaluation of personnel injured or exposed to hazardous materials during the remediation activities. See Section 4 for details of the medical surveillance program.

2.1.16 ANL-W Quality Assurance Engineer

The ANL-W Office of Quality Assurance will provide a quality assurance engineer to conduct an independent evaluation of quality issues when requested. The quality assurance engineer observes the remedial action activities and verifies that task operations comply with quality requirements pertaining to these activities. The quality assurance engineer identifies activities that do not comply or have the potential for not complying with quality requirements and suggests corrective actions.

2.2 Recordkeeping Requirements

2.2.1 Industrial Hygiene and Radiological Monitoring Records

The ANL-W IH will record all air monitoring and personal sampling data collected during the remediation activities at ANL-W. Industrial hygiene monitoring data are treated as limited access information and are maintained by the IH per ANL-W *Environment, Safety and Health Manual*. The ANL-W HPT keeps a logbook of all radiological monitoring, daily operational activities, and instrument calibrations. Radiological monitoring records are maintained according to Chapter 7 of the ANL-W *Radiological Control Manual*.

2.2.2 Logbook

The CERCLA Project Manager will keep a record of daily events in remedial activities logbook and also responsible for maintaining an accurate record of all personnel (workers and nonworkers) who are on site each day in the logbook. The CERCLA Project Manager will record in the log book the names, times, and dates of the personnel who enter the controlled areas. The logbook will be submitted to the Administrative Record and Document Control (ARDC) along with other important documents at the project's completion.

2.2.3 Administrative Record and Document Control Office

The ARDC is responsible for organizing and maintaining data and reports generated by EWMP activities. The ARDC maintains a supply of all controlled documents and provides a documented system for the control and release of controlled documents, reports, and records. Copies of the this HSP, the quality assurance project plan, sampling and analysis plan, and other documents pertaining to this task are maintained in the project file by the ARDC. All project records and logbooks, except ANL-W IH and ANL-W HPT logbooks, must be forwarded to ARDC within 30 days after completion of field activities.

3. PERSONNEL TRAINING

All personnel who are working in the field on the remedial action will receive training as specified by OSHA 29 CFR 1910.120. Radiation worker training shall be in accordance with Chapter 6 of the ANL-W *Radiological Control Manual*. Table 2 summarizes training requirements for key personnel. Specific training requirements for each worker may vary depending on the hazards associated with the job assignment.

Proof of completion of all required training courses (including refresher training) must be maintained on the site at all times. Examples of acceptable written training documents include, EG&G IDF-5483.C, "40 Hour OSHA HAZWOPER Card,"

Prior to beginning work a project safety orientation will be conducted by the CERCLA Project Manager and the ANL-W IH. The orientation will consist of a complete review of this HSP and attachments, with time for discussion and questions. At this time, personnel training will be checked and verified to be current and complete for all required training shown in Table 1. Upon completing the safety orientation, personnel will sign the training acknowledgment form (Section 11 of this HSP) to indicate that they have received the briefing and understand the HSP. A daily briefing of the task(s) to be performed that day will be provided by the CERCLA Project Manager, HSO, JSS, and ANL-W HPT (as applicable); during the briefing the tasks are to be outlined, hazards identified, hazard controls and work zones established, and personal protective equipment requirements discussed. After the completion of this briefing, worker's health and safety questions concerning tasks will be addressed and work control documents read and signed [e.g., Safe Work Permit(s), Radiological Work Permit(s), Hot Work Permit(s)].

4. OCCUPATIONAL MEDICINE PROGRAM AND MEDICAL SURVEILLANCE

Personnel working on the remedial action project shall participate in the INEEL OMP per the requirements of OSHA 29 CFR 1910.120, which requires medical surveillance examinations prior to assignment, annually, and after termination of hazardous waste duties. This includes employees who are or who may be exposed to hazardous substances at or above published exposure limits, without regard to respirator use, for 30 or more days per year, as well as those who wear a respirator for 30 or more days per year. Employees who must use a respirator in their job or who are required to take training to use a respirator to perform their duties under this plan must be medically evaluated for respirator use at least annually and meet the requirements for respirator use defined in the ANL-W ES and H Manual. Job-related information must be provided to the OMP for each hazardous material worker. This information must be submitted to the OMP before work begins. Information furnished to the OMP must be supplemented or updated annually as long as the employee is required to maintain hazardous waste/hazardous material worker medical clearance.

Table 2 Minimum Training Requirements for Remedial Action Personnel					
Qualification	CERCLA PM	HSO	PS Laborers and Material Services Personnel	ANL-W IH	ANL-W HPT
Site Orientation <2 weeks at ANL-W	X	X	X	X	X
General Employee Training >2 weeks at ANL-W	X	X	X	X	X
Decontamination SOP's	X	X	X	X	X
ANL-W Site Control and Warning Devices	X	X	X	X	X
ANL-W Orientation film	X	X	X	X	X
ANL-W Radiological Worker I Training	X	X	X	X	
40 hour HAZWOPER 29 CFR 1910.120(e)(4)	X	X	X	X	X
24 hour HAZWOPER field experience 29 CFR 1910.120(e)(4)	X	X		X	
8 hour HAZWOPER site supervisor 29 CFR 1910.120(e)(4)	X	X		X	
8 hour HAZWOPER refresher ^{training} 29 CFR 1910.120(e)(8)	X ¹	X ¹	X ¹	X ¹	X
Hazard Communication 29 CFR 1910.120 29 CFR 1926.59	X	X	X	X	X
First-aid/CPR ²	X ²	X ²		X	
Respirator Trained ³	X	X	X		X

¹ If Applicable, must be completed every year after 40 hour HAZWOPER class or equivalent training.

² Red Cross first-aid/CPR trained personnel or equivalent on site at all times.

³ EG&G-2533, "Respirator Authorization Card," DOE Certificate of Core Radiological Training I or II Card," "first-aid/CPR training," and/or a copy of an individual's Training Inquiry System (TIS) printout demonstrating completion of training. A copy of the certificate issued by the institution where the training was received is also acceptable proof of training.

The OMP is responsible for evaluating the physical ability of a worker to perform the task assigned, and provides medical clearance to the worker for the work to be performed. The OMP may impose restrictions on the employee by limiting the amount or type of work performed.

- Current comprehensive medical examinations in an INEEL medical facility for full-time employees
- Records and reports from employees' private physicians, as required by the site Occupational Medicine Director
- Medical evaluation by the OMP on return to work following an absence in excess of one work week (40 consecutive work hours) resulting from illness or injury
- Medical evaluation in the event that a supervisor questions the ability of an employee to work
- Medical evaluation in the event that an employee questions their own ability to work.
- The information provided on the forms and by employee examination are used to determine the following for each employee:
 - Ability to perform relevant occupational tasks
 - Ability to work in protective equipment and heat stress environments
 - Ability to use respiratory protection (subcontractor must provide for employees)

NOTE- If the OMP does not have sufficient information at the time of request for clearance for respirator training, the employee's supervisor will be notified and clearance will be withheld until the needed information is provided and any additional examination or testing is completed.

- Entry into substance-specific medical surveillance programs.

Health Physics personnel will determine the need for medical intervention when an abnormal radiological exposure is suspected based on calculated committed effective dose equivalent values.

4.1 Injuries Incurred During Remediation Activities

It is the policy of the OMP to examine all workers if the workers are injured on the job, if they are experiencing symptoms consistent with exposure to a hazardous material, or if there is reason to believe that they have been exposed to toxic substances or physical agents in excess of allowable limits.

In the event of a known or suspected injury or illness due to exposure to a hazardous substance or physical agent, the worker(s) shall be transported to the nearest medical facility for evaluation, with as much information as possible regarding the suspected cause of injury or illness. As much of the following information as is available will accompany the individual to the medical facility:

- Name, job title, work location, and supervisor's name and phone number
- Substances or physical agents (known or suspected); material safety data sheet (MSDS) if available
- Date of employee's first exposure to the substance or physical agent
- Locations, dates, and results of exposure monitoring
- PPE in use during this task (for example, respirator and cartridge)
- Number of days per month PPE has been in use
- Anticipated future exposure to the substance or agent.

Further medical evaluation will be in accordance with the symptoms, hazard involved, exposure level, and specific medical surveillance requirements.

4.3 Substance-Specific Medical Surveillance

No substance-specific medical surveillance requirements apply to personnel working on the remediation activities associated with OU 9-04.

5. SAFE WORK PRACTICES

5.1 General Safe Work Practices

The following general safe work practices that will be followed are:

1. Do not wear contact lenses in designated eye-hazard areas unless they are essential to correct a vision defect not correctable by prescription safety glasses.
 2. Absolutely no eating, drinking, chewing gum or tobacco, smoking, applying cosmetics, or any other practice that increases the probability of hand-to-mouth transfer and ingestion of materials in the designated zone(s).
 3. Report all broken skin or open wounds to the subcontracted HSO or CERCLA Project Manager. The OMP will determine if the wound presents a significant risk of internal chemical or radiological exposure. The OMP evaluation will consider how the wound is bandaged and will recommend PPE to be worn by the injured employee. Personnel with unprotected wounds shall not be permitted to enter contamination areas, nor shall they handle contaminated or potentially contaminated materials at the site.
 4. Avoid direct contact with potentially contaminated substances. Do not walk through spills or other areas of contamination. Avoid kneeling, leaning, or sitting on equipment or ground that may be contaminated.
 5. Be alert for dangerous situations, strong or irritating odors, airborne dusts or vapors, and broken containers. Report all potentially dangerous situations to the CERCLA Project Manager or HSO.
 6. Prevent releases of hazardous materials during remediation activities. If a spill occurs, contain it (if possible) and report it to the CERCLA Project Manager. Steps must then be taken to clean it up in accordance with the appropriate procedure, which may mean activating the emergency preparedness procedures for the area. Guidelines for spill cleanups are found in ANL-W *Environment, Safety and Health Manual*. Appropriate spill kits, or other containment and absorbent materials will be maintained at the work site. See Section 10 of this HSP for more details on the spill response plan.
 7. Avoid splashing and overspray during decontamination.
 8. Keep all ignition sources at least 50 ft from explosive or flammable environments and use nonsparking, explosion-proof equipment if advised to do so by a safety professional.
 9. Be familiar with the contaminants associated with the five sites being remediated, and physical conditions at the site during remediation activities including but not limited to:
 - Wind direction
-

- Accessibility of fellow workers, equipment, and vehicles
 - Communications with other nearby facilities in the vicinity of the work being performed
 - Areas of known or suspected contamination
 - Major roads and means of access to and from each site
 - Nearest water sources and fire fighting equipment
 - Warning devices and alarms
 - Capabilities and location of nearest emergency assistance.
10. If you are working in the exclusion zone, work in teams according to the "buddy system" (see Section 5.3 of this HSP).
11. Proceed directly to a survey station upon leaving a radiological contamination zone. Care should be taken not to touch the face, mouth, and eyes before a survey has been performed.

5.2 ALARA Principles

Personnel working at ANL-W must strive to keep radiation exposure as low as reasonably achievable (ALARA) through the following practices:

- Radiological Work Permit Compliance
 - Radiation exposure limit awareness
 - Adhere to all written radiological requirements and verbal guidance
 - Be aware of personal radiation exposure history
 - Work within ALARA guidelines and make suggestions as needed
 - Minimize the production of all radioactive waste
 - Minimize personal radiation exposure by adhering to these basic protection techniques:
-

- Time-Exposure is minimized as time is minimized
- Distance-Maintain a maximum distance from the radiation source
- Shielding-Use any solid material (such as lead, steel, or concrete) as a shield

5.3 The Buddy System

The buddy system will be used at ANL-W to ensure that each worker's mental and physical well-being is monitored during the course of the day. Personnel will be assigned a "buddy" by the CERCLA Project Manager to work with and regularly check on during the day. A record of the buddy assignments will be maintained by the CERCLA Project Manager, and updated as necessary. Workers need to be able to see or hear and effectively communicate with their buddy at all times when in the exclusion zone. Everyone should watch for signs and symptoms of illness or injury in their assigned "buddy" and other personnel in the area.

6. SITE CONTROL AND SECURITY

Figure 4 shows the typical boundaries that will be used during the remedial action activities at the five OU 9-04 sites. The West portion of the Main Cooling Tower Blowdown Ditch will not require these boundaries because this site is located in between two security fences with controlled access. The other units that are either inside or outside the security fences will require roping off the exclusion zone to prevent access by nonworkers. The following sections provide an explanation of the exclusion zone, as defined by OSHA.

6.1 Exclusion Zone

The exclusion zone includes the immediate work area around the chemical/radiological contamination area. The minimum number of personnel required to safely perform the required operations will be allowed into the exclusion zone.

6.2 Contamination Reduction Zone

The contamination reduction zone is typically a transition area that surrounds the exclusion zone, and is located between the exclusion zone and the support zone. This zone is not necessary based on the results of the previous sampling episodes.

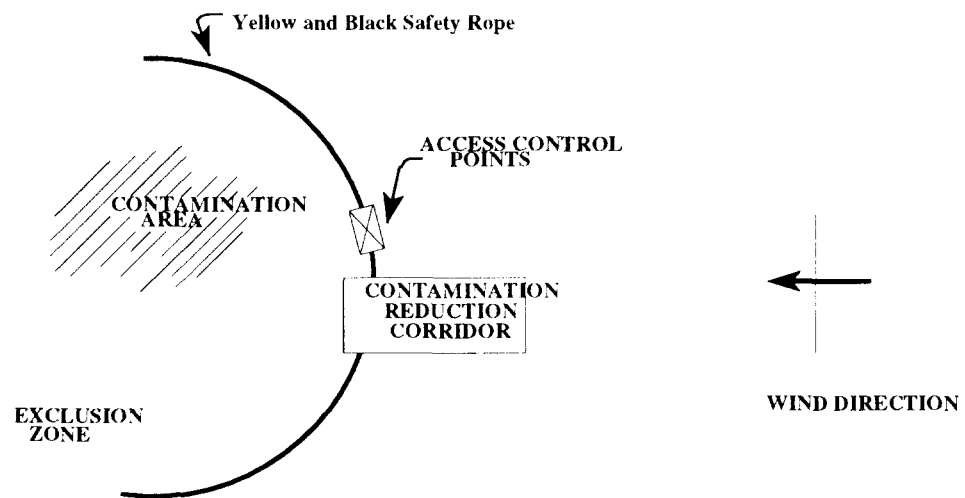


Figure 4 Site Control Boundary that will be used during remediation.

6.3 Support Zone

The support zone is typically the area outside the contamination reduction zone. Likewise, this zone is not necessary during the remediation since the contaminant concentrations are known and the associated risks to humans is low.

6.4 Designated Eating Area

Ingestion of hazardous substances is likely when workers do not practice good personal hygiene. It is important to wash hands, face, and other exposed areas thoroughly after completion of work and before smoking, eating, drinking, and chewing gum or tobacco. No smoking, chewing, eating, or drinking is allowed during remedial actions inside the exclusion zones. Personnel at ANL-W may smoke outside of any buildings and in personal vehicles.

7. HAZARD EVALUATION

Personnel may be exposed to industrial safety hazards, or chemical and physical agents while remedial actions are being implemented. The degree of hazard(s) posed to onsite personnel entering the exclusion zone is dependent on both the chemical nature of the contaminant(s) and the task(s) being performed. Table 3 summarizes each task and the anticipated hazards for each site. Tables 4 through 8 contain information about the anticipated hazardous chemicals present for each site.

Radiological hazards are outlined in Section 7.2.

The industrial hygiene and radiological hazard monitoring plans are outlined in Sections 7.3.1 and 7.3.2 respectively.

Table 3 Task and Associated Hazards or Hazardous Agents	
Activity or Task	Associated hazards or hazardous agents
Plant Grubbing, Soil Grading in all Ditch Channels	Workers will be working in identified CERCLA sites, Potential Hazards are various inorganic metals listed in Table 3 and the potential of radiological contamination.
Drilling Activities	Subsurface Samples will be collected using a hollow stem drill rig which is typically dangerous in these activities: overhead hazards, lifting heavy material, potential hot work, electrical hazards, and flammable hazards. The drilling activities will be conducted in identified CERCLA sites which contain various heavy metals listed in Table 3 and the potential exists for radioactive contamination.

**Table 4 Information on the Chemicals Present at the
Main Cooling Tower Blowdown Ditch.**

OVERALL HAZARD SUMMARY:

Serious _____ Moderate _____ Low X Unknown _____

MATERIAL TYPES(S):

Liquid _____ Solid _____ Sludge X Gas _____

PROJECT CHARACTERISTICS:

Corrosive _____ Ignitable _____ Radioactive _____ Volatile _____
Toxic X Reactive _____ Unknown _____ Biohazards _____

POSSIBLE CONSTITUENTS AND ACTION LEVELS:

<u>Constituents</u>	<u>Ceiling</u>	<u>Lowest TLV/PEL</u>	<u>Action</u>	<u>Known</u>
Mercury	0.1 mg/m ³	0.1 mg/m ³	.0125 mg/m ³	8.83 (mg/kg)
Chromium +3	NA	0.5 mg/m ³	0.25 mg/m ³	709 (mg/kg)

Table 5 Information on the Chemicals Present at Ditch A.

OVERALL HAZARD SUMMARY:

Serious _____ Moderate _____ Low X Unknown _____

MATERIAL TYPES(S):

Liquid _____ Solid _____ Sludge X Gas _____

PROJECT CHARACTERISTICS:

Corrosive _____ Ignitable _____ Radioactive X Volatile _____

Toxic _____ Reactive _____ Unknown _____ Biohazards _____

POSSIBLE CONSTITUENTS AND ACTION LEVELS:

<u>Constituents</u>	<u>Ceiling</u>	<u>Lowest TLV/PEL</u>	<u>Action</u>	<u>Known Concentration</u>
Mercury	0.1 mg/m ³	0.1mg/m ³	0.0125 mg/m ³	3.94 (mg/kg)

Table 6 Information on the Chemicals Present at Ditch B.

OVERALL HAZARD SUMMARY:

Serious _____ Moderate _____ Low X Unknown _____

MATERIAL TYPES(S):

Liquid _____ Solid _____ Sludge X Gas _____

PROJECT CHARACTERISTICS:

Corrosive _____ Ignitable _____ Radioactive X Volatile _____

Toxic _____ Reactive _____ Unknown _____ Biohazards _____

POSSIBLE CONSTITUENTS AND ACTION LEVELS:

<u>Constituents</u>		<u>Lowest TLV/PEL</u>	<u>Action</u>	<u>Known Concentration</u>
Chromium III		0.5 mg/m ³	0.25 mg/m ³	1,306 (mg/kg)
Zinc	Residential dust	5 mg/m ³	5 mg/m ³	3,020 (mg/kg)
Zinc	Total dust	15 mg/m ³	15 mg/m ³	

Table 7 Information on the Chemicals Present at the Interceptor Canal-Mound.

OVERALL HAZARD SUMMARY:

Serious _____ Moderate _____ Low X Unknown _____

MATERIAL TYPES(S):

Liquid _____ Solid _____ Sludge X Gas _____

PROJECT CHARACTERISTICS:

Corrosive _____ Ignitable _____ Radioactive X Volatile _____

Toxic _____ Reactive _____ Unknown _____ Biohazards _____

POSSIBLE CONSTITUENTS AND ACTION LEVELS:

Constituents	Lowest TLV/PEL	<u>Known Concentrations</u>
Cesium-137	NA	30.5 (pCi/gram)

Table 8 Information on the Chemicals Present at the North Ditch.

OVERALL HAZARD SUMMARY:

Serious _____ Moderate _____ Low X Unknown _____

MATERIAL TYPES(S):

Liquid _____ Solid _____ Sludge X Gas _____

PROJECT CHARACTERISTICS:

Corrosive _____ Ignitable _____ Radioactive _____ Volatile _____

Toxic X Reactive _____ Unknown _____ Biohazards _____

POSSIBLE CONSTITUENTS AND ACTION LEVELS:

<u>Constituents</u>	<u>Lowest TLV/PEL</u>	<u>Action</u>	<u>Known Concentrations</u>
Silver	0.01mg/m3	0.005 mg/m ³	352 (mg/kg)

7.1 Exposure Signs and Symptoms of Chemicals Present.

Chemicals that may be encountered during the remediation activities are listed below along with the acute and chronic exposure symptoms, and emergency treatment procedures.

Chromium +3

Exposure Signs and Symptoms

Symptoms: Clammy cyanotic skin, sore throat, gastric burning, vomiting, and diarrhea. Chromic acid is irritating to the skin, and prolonged contact can cause ulceration. Inhalation of chromate dust or chromic acid mist can result in severe irritation of the nose, throat, bronchial tubes, and lungs and may cause coughing, labored breathing, and swelling of the larynx.

Toxicity: Trivalent chromium is not considered toxic.

Emergency Treatment

Flood eyes and affected skin for at least 15 minutes. Remove from further exposure and give artificial respiration if necessary. *See a physician.*

Mercury

Exposure Signs and Symptoms

Acute: Metallic taste, thirst, severe abdominal pain, vomiting, bloody diarrhea, difficulty in breathing, cough, fever, nausea, fluid accumulation in lungs, kidney failure.

Chronic: Weeping dermatitis, diarrhea, liver and renal damage, tremors, salivation, loosening of teeth, inflammation of the kidney, anxiety, headache, weight loss, anorexia, mental depression, insomnia, irritability, instability, hallucinations, mental deterioration.

Emergency Treatment

Induce vomiting of ingested poison and remove from further exposure. *See a physician.*

Silver

Exposure Signs and Symptoms

Acute: The acute toxicity of silver metal is low. The acute toxicity of soluble silver compounds depends on the counterion and must be evaluated case by case. For example, silver nitrate is strongly corrosive and can cause burns and permanent damage to the eyes and skin.

Chronic: Chronic exposure to silver or silver salts can cause a local or generalized darkening of the mucous membranes, skin, and eyes known as argyria. Other chronic effects of silver compounds must be evaluated individually.

Emergency Treatment

In the event of skin contact immediately wash the area with soapy water. In case of eye contact promptly wash with copious amounts of water. *See a physician.*

Zinc

Exposure Signs and Symptoms

Zinc is not classified as a human carcinogen. Zinc is an essential metal where deficiency results in severe health effects. Excess exposure is uncommon and requires high exposures because zinc does not accumulate in the body.

EXPOSURE SIGNS AND SYMPTOMS: COMMON RADIOACTIVE CHEMICALS

Cesium

Exposure Signs and Symptoms

Physical characteristics: Gamma/x-ray radiation is an electromagnetic wave or photon and has no electrical charge. Gamma rays are very similar to x-rays. The only difference is in the place of origin. Gamma/x-ray radiation can ionize as a result of direct interactions with orbital electrons. The energy of the gamma/x-ray radiation is transmitted directly to its target.

Range: Because gamma/x-ray radiation have no charge and no mass, they have a very high penetrating power. Range in air is very far.

Biological hazard: Can result in radiation exposure to the whole body which could result in cancer.

Emergency Treatment

Follow instruction from health physics technicians to decon. Wash exposed skin with soap and water. *See a physician.*

7.2 Radiological Hazards

All of the sites being remediated have the potential for having radiological hazards. These hazards are suspected to be minimal based on findings during the Baseline Risk Assessment performed for all five sites in 1997. The highest soil activity encountered during sampling was 55 picocuries/gram of cesium-137 radioactivity. Cesium-137 was the most common isotope detected and average concentrations were less than 10 picocuries/gram. An ANL-W HPT will be assigned to survey the equipment and personnel during the remedial action activities.

7.3 Environmental and Personnel Monitoring

Personnel working on the remedial action of these five sites may be exposed to hazardous materials or hazardous physical agents, as already described. Industrial

safety hazards and other physical hazards will be monitored and controlled as outlined in Section 7.4. Specific hazardous agent exposures that will be monitored are indicated in Table 8. Industrial hygiene and radiological monitoring plans are described in Sections 7.3.1 and 7.3.2.

7.3.1 Industrial Hygiene Monitoring

The equipment listed in Table 9 may be used by the ANL-W IH to monitor chemical and (nonradiological) physical agent.

All industrial hygiene equipment will be maintained by the IH per the manufacturer's recommendations. Instruments will be calibrated before and after use, or according to those recommended by the manufacturer.

Air sampling will be conducted using NIOSH methods and according to the ANL-W *Environment, Safety and Health Manual*. Samples will be personal samples whenever possible; each nonradiological contaminant/agent listed in Tables 3 through 8. will be monitored. The number and frequency of sampling will depend on the IH's assessment of potential exposures and risk to personnel, in accordance with ANL-W *Environment, Safety and Health Manual*. Sampling data, results from direct-reading instruments, and field observations, will be recorded for future use.

Table 9 Equipment to be used for Monitoring by ANL-W Industrial Hygienist.		
Unit	Equipment	Agent to be Monitored
Main Cooling Tower Blowdown Ditch	Personal air monitoring pumps, miniram	Heavy Metals, Dust, mercury vapor analyzer
Ditch A	Personal air monitoring pumps, miniram	Heavy Metals, Dust, mercury vapor analyzer
Ditch B	Personal air monitoring pumps, miniram	Heavy Metals, Dust, mercury
Interceptor Canal-Mound	Personal air monitoring pumps, miniram	Heavy Metals, Dust
Industrial Waste Lift Station Discharge Ditch	Personal air monitoring pumps, miniram	Heavy Metals, Dust

7.3.2 Radiological Monitoring

Radioactive contamination for the five sites is outlined in Section 7.2. Additional surveys, smears, and other sampling will be performed if deemed necessary by the ANL-W HPT. Appropriate survey equipment will be used by the ANL-W HPT to verify boundaries and work zones, survey personnel and equipment before leaving the exclusion zone to verify that waste items are sent to the appropriate disposal facility.

The ANL-W HPT will be responsible for radiological monitoring in accordance with the ANL-W *Radiological Control Manual*, Chapters 5 and 7; and ANL-W *Environment, Safety and Health Manual*. All health physics equipment will be source-checked weekly and calibrated according to Chapter 5 of the ANL-W *Radiological Control Manual*. The equipment will be maintained by the ANL-W HPT according to the manufacturer's instructions.

Radiological contamination will be monitored as prescribed by the applicable task Radiological Work Permit.

7.3.3 Action Levels

To ensure worker safety during remediation, action levels have been set and labeled for the contaminants listed in Tables 3 through 8. If these contaminants reach the actions levels(s) noted, the corrective action will be taken.

7.4 Physical Hazards Evaluation, Control, and Monitoring

The physical hazards present at the five sites being remediated and the methods that will be used to monitor and control them, are described in the following paragraphs.

7.4.1 Temperature Extremes

The work will be conducted in April and October for each year during the two-year field scale testing. It is anticipated that because of this time of year workers could be exposed to adverse temperatures. As a precautionary measure the types of temperature extremes and conditions are being mentioned.

Heat Stress. Workers may be required to work outdoors during summer/fall months and wear protective clothing that prevents the body

from cooling. High body temperatures can result in heat fatigue, physical discomfort, and death. Personnel must inform the CERCLA Project Engineer or HSO if they experience any of the signs and symptoms of heat stress or observe that their work buddy is experiencing these symptoms.

Monitoring for heat stress conditions shall be performed by the ANL-W IH according to the ANL-W *Environment, Safety and Health Manual*. Depending on the ambient weather conditions, work conditions, and physical response of task operations personnel, the ANL-W IH will inform the subcontracted JSS and FTL of necessary adjustments to the work/rest cycle. A supply of cool drinking water will be provided outside the exclusion zone and workers.

Workers may be periodically interviewed by the ANL-W IH or subcontracted HSO to ensure that the controls are effective and that excessive heat exposure is not occurring. Workers will be encouraged to monitor their body signs and to take a break if symptoms of heat stress occur. The signs of heat stress are:

- Clammy skin
- Dizziness or nausea
- Fatigue
- Profuse sweating
- Skin color change
- Vision problems.

Individuals showing any of the symptoms listed above will stop work, move to a shaded area outside of the controlled areas to rest, provided cool drinking water, and be monitored by a first-aid/CPR qualified person. If personnel exhibiting symptoms of heat stress do not show signs of immediate recovery when removed to the rest area, they will be transported to the dispensary for medical attention.

Heat stroke is an extremely serious condition that can result in death and should be treated as such. Anyone who stops sweating, or who shows symptoms of confusion, slurred speech, or any other evidence of

change in level of consciousness, will be transported immediately to the nearest medical facility for evaluation.

Cold Stress. Exposure to low temperatures may be a factor if work is done in the winter months, or at any time of year if the conditions are right. Relatively cool ambient temperatures, and wet or windy conditions increase the potential for cold injury to personnel. The ANL-W IH will monitor cold stress conditions in accordance with the ANL-W *Environment, Safety and Health Manual*.

7.4.2 Noise

Personnel working near heavy equipment may be exposed to noise levels in excess of 85 db(A) during drilling activities. Noise monitoring will be performed by the IH to determine if persons assigned to the drilling activities are exposed to noise over the allowable 8-hour time-weighted average of 85 db(A). Persons whose exposure exceeds the allowable level will be enrolled in the INEEL, OMP Hearing Conservation Program. Personnel working on jobs that are noisy will be required to wear hearing protection until the noise levels have been evaluated, and will continue to wear the hearing protection specified by the ANL-W IH until directed otherwise.

7.4.3 Fire and Explosion Hazards

Explosion and fire hazards at the site include the use of solvents, gasoline, and diesel fuel used during the drilling activities. All combustible material will be labeled, handled, and stored in accordance with the ANL-W *Environment, Safety and Health Manual*.

7.4.4 Biological Hazards

Biological hazards are not associated with any of the five sites being remediated. Possible pathogens could however be associated with mice (Hantavirus). All subcontracted sampling personnel and ANL-W personnel shall take extra precautions when animal fecal matter is encountered. The appropriate PPE will be identified in this HSP and can be upgraded as deemed necessary by the HSO after contacting the ANL-W IH.

7.4.4.1 Bloodborne Pathogens

Bloodborne pathogens are a risk to those personnel who may become injured during remediation activities. These bloodborne pathogens include but not limited to hepatitis B virus, (HBV) and human immunodeficiency virus (HIV). Extra precautions including the use of rubber gloves will be taken while personnel are collecting the sludge. Section 5.23 of the ANL-W *Environment, Safety and Health Manual* contains all the ANL-W requirements.

7.4.6 Confined Spaces

Work in confined spaces may subject workers to risks involving engulfment, entrapment, oxygen deficiency and toxic or explosive atmospheres. The sites being remediated are not confined spaces but, the drainage ditches may cause a small scale inversion that could collect exhaust gasses. Procedures for entering a confined space are outlined in the ANL-W *Environment, Safety and Health Manual*. Prior to entry of a confined space approval must be granted by the ANL-W IH, ANL-W project lead engineer and the subcontracted HSO. A trained attendant will be outside the space to assist entrants, monitor the well-being of entrants, and notify the rescue team, if necessary. Personnel required to enter the space will be thoroughly briefed on the hazards involved, the meaning of warning signals of any monitoring equipment that is worn or taken into the space, any special tools or equipment to be used, and actions to take in case of an emergency. The emergency rescue plan is outlined below.

7.4.7 Industrial Safety Hazards

Handling Heavy Objects. During activities that will be conducted manually may result in personal injury. Manual material handling will be minimized through task design and use of mechanical and hydraulic lifts whenever possible. Proper work practices will be discussed with the team during the pre-job briefing and as necessary during the job task.

Field team members will be trained in the proper methods of lifting heavy objects and cautioned against lifting objects that are too heavy for the individual to handle safely. In addition, the HSO will periodically review the basics of safe lifting in the daily safety briefings.

People involved in manual material handling will wear hand protection (i.e., leather gloves) as directed in the HSP.

Heavy Equipment. All heavy equipment will be properly maintained and used by qualified individuals in a safe manner and in accordance with the manufacturer's recommendations. The ANL-W *Environment, Safety and Health Manual* will be followed for all work performed with power tools including powered chippers and mowers. No gas or diesel powered tool will be refueled while running. Employees who use powered hand augers shall be trained in their use, wear appropriate PPE, and stop working with the auger if there is a question regarding its safe use.

Moving Machinery and Failing Objects. All heavy equipment that is moved must have the boom lowered to a stationary position. This will prevent an accidental contact by overhead power lines.

Electrical Hazards. Electrical equipment and tools as well as overhead and underground lines may pose shock or electrocution hazards to employees. Safety-related work practices shall be employed to prevent electric shock or other injuries resulting from direct or indirect electrical contact. These practices will conform with the requirements in 29 CFR 1910, Subpart S; 29 CFR 1926, Subpart K; and the ANL-W *Environment, Safety and Health Manual*. In addition all electrical work will be reviewed and completed under the appropriate work controls (i.e., HSPS, SWPS, Work Orders). When working on deenergized systems, the requirements in the ANL-W *Environment, Safety and Health Manual* on lockouts and tagouts, will be followed.

Work on energized systems will be minimized. If work on energized systems is necessary, work will be performed only by a qualified electrician in accordance to the ANL-W *Environment, Safety and Health Manual* and a qualified electrical backup must be present whenever work on energized systems is done.

Portable electrical tools and equipment also have the potential to cause shock or electrocution. Portable electrical tools will be double insulated and have three-prong type grounded cords. All circuits will be ground fault circuit interrupted (GFI) protected and approved for use if operated in hazardous areas. All equipment and cords will be visually inspected before use. In addition all portable electrical tools shall be included in the semiannual inspection and testing program. The requirements in the ANL-W *Environment, Safety and Health*

Manual. will be followed for all work using portable electrical tools or equipment.

Overhead electrical hazards will be identified by operating personnel before raising masts on drill rigs or using cranes. Minimum distances for working near overhead power lines, found in Table 4-1 of the DOE Hoisting and Rigging Manual, will be followed. The requirements in the ANL-W *Environment, Safety and Health Manual*, will be followed for all work performed near overhead lines. ANL-W requires a minimum clearance of 13 ft is maintained between the heavy equipment and energized power lines. In addition durable, signs will be placed at the operator's station and on the outside of the equipment warning that electrocution or serious bodily injury may occur if contact is made with overhead lines.

Underground utility clearances will be obtained before drilling or excavating operations by contacting Telecommunications (526-1688 or 526-2512). The requirements for advanced notice of 48 hours will be met.

Heavy Equipment. The hazards associated with the operation of heavy equipment include injury to personnel, equipment damage, and/or property damage. All heavy equipment will be used in the manner in which it was intended. Drivers will operate all equipment in accordance with manufacturers instructions and within the safe operating parameters as defined by the manufacturer. Only required personnel will be allowed in the vicinity of operating heavy equipment and should maintain visual contact with the operator.

Personal Protective Equipment. Wearing PPE will reduce a worker's ability to move freely, see clearly, and hear directions and noise that might indicate a hazard. Also, PPE can increase the risk of heat stress. Work activities will be modified as necessary to ensure that personnel are able to work safely in the PPE that is required.

Elevated Work Areas. No elevated work is anticipated during the remediation of the five sites. However, if personnel are required to work on elevated equipment or at heights, work will be performed, using a safety belt/harness and lanyard, as per ANL-W *Environment, Safety and Health Manual*. Personnel required to use fall protection PPE shall be trained in its proper use, limitations, and how to maintain and inspect the equipment.

Handling Heavy Objects. Operations personnel may risk injury by lifting heavy objects. All operations personnel are therefore cautioned against lifting objects that are too heavy or too awkward and should seek assistance to lift these objects. Mechanical and hydraulic assists will be used whenever possible to minimize lifting dangers.

Moving Machinery and Falling Objects. Personnel may be subject to cuts and bruises, or get caught in moving machinery during certain remediation activities. Injuries will be avoided or minimized by following safe practices for operation of machinery; ensuring that guards are maintained in place; wearing gloves, eye protection, hard hats, and steel toed boots; and using mechanical assists whenever possible. Loose clothing or neck chains for security badges will not be worn; long hair must be pulled back and secured when working around equipment with moving parts.

Decontamination. The chemical and radiological decontamination processes used to remove contaminants from tools, equipment, and 9-04 personnel can spread contamination and increase the risk of exposure if decontamination activities are not performed according to procedures. High pressure hot water and steam, if used in the process, can present a hazard if it rebounds into the face or onto the body of personnel, and contaminants may become airborne from this process. Decontamination procedures must be followed and appropriate PPE must be used during decontamination activities.

Inclement Weather. In the event that adverse weather conditions develop that pose a threat to persons or property, such as sustained strong winds (25 mph or greater), electrical storms, heavy precipitation, or extreme heat or cold, the situation will be evaluated by the CERCLA Project Manager with input from the HSO, ANL-W IH, ANL-W safety engineer, ANL-W HPT, and other personnel, as appropriate. A decision to stop all work will be made by the CERCLA Project Manager with input from the HSO, ANL-W IH, and ANL-W HPT based on the hazards involved and the situation. In some cases, work at the site may proceed provided that workers are afforded adequate, appropriate protection. At no time will individual health and safety be jeopardized in order to continue work.

Excavation. Excavation activities will be conducted both manually and mechanically at these sites. Excavation work is inherently dangerous to either the manual and mechanical methods employed here. The manual excavation will require the proper tools to complete their tasks with

minimal exertion and proper body alignment. However, mechanical excavation is also very dangerous and will require the operators of the heavy equipment to be properly trained and the equipment maintained in accordance with the manufacturers maintenance requirements. no time will individual health and safety be jeopardized in order to continue work.

7.5 Other Hazards

Personnel should look for potential hazards and immediately inform the CERCLA Project manager or HSO of the hazards so that action can be taken to correct the condition.

The CERCLA Project Manager will conduct weekly inspections to ensure that barriers and signs are being maintained, unsafe conditions are corrected, and debris is not accumulating on the site. These inspections will be noted in the Project logbook. Health and safety professionals present may at anytime recommend changes in work habits to the CERCLA Project Manager.

Individuals working on the remediation activities are responsible to use safe work techniques, report unsafe working conditions, and exercise good personal hygiene and housekeeping habits throughout the course of their job. All personnel should be reminded that the potential exists to encounter rattlesnakes, especially when using tamps and other heat retaining objects in the fall months.

8. PERSONAL PROTECTIVE EQUIPMENT

Personnel protective equipment that will be used during remediation of the five sites was selected based on the toxicity, route of entry, physical form of contaminant, and anticipated levels of known or suspected hazardous materials and agents. Recommendations contained in NIOSH (1985), and on the hazard analysis in Section 7 of this HSP. Table 10 lists the PPE that will be used for each of the five sites.

8.1 Level D Personal Protective Equipment

Level D PPE affords little protection against chemical hazards since personnel are not expected to be exposed to hazardous chemicals above an allowable limit and no danger exists due to absorption of chemicals through the skin. Level D is basically a standard work uniform. Level D PPE will consists of:

- Tyvek Coveralls or cloth coverall may be substituted
 - Eye protection
-

- Steel-toe leather boots

8.2 Level C Personal Protective Equipment

Level C PPE is appropriate for use when the contaminants are well characterized and personnel can be protected using air purifying respirators; there is minimal hazard exposure to personnel via skin absorption; and there is very little danger that an IDLH (immediately dangerous to life or health) condition will develop. Personnel who are requiring Level C PPE shall wear:

- Full-face air-purifying respirator with
- Chemical-resistant TYVEK coveralls
- Steel-toe leather boots
- Chemical-resistant outer shoe/boot cover
- Inner gloves
- Outer gloves

PPE must be inspected by the user prior to donning it and before entry into the zone. Items that are found to be defective will not be used.

8.3 Level B Personal Protective Equipment

Level B PPE will be required when personnel cannot adequately be protected with air-purifying respirators because of high levels of contaminants present or the unavailability of appropriate respirator cartridges, there is a significant hazard due to skin exposure, or the danger of an IDLH condition developing exists. Level B PPE consists of:

- Air-line respirator or self-contained breathing apparatus (SCBA), with escape SCBA
 - Chemical resistant TYVEK coveralls
 - Steel-toe leather boots
 - Chemical-resistant outer boots
-

- Inner chemical-resistant gloves
- Outer chemical-resistant gloves

PPE must be inspected by the user prior to donning it and before entry into the zone. Items that are found to be defective will not be used.

8.4 Level A Personal Protective Equipment

Has the maximum respiratory, skin, and eye protection, that is typically used in an isolated situation, in situations where the levels of contaminants are known to be very high and dangerous, where levels are completely unknown, and where an IDLH condition could develop. Components of a Level A PPE include:

- SCBA, and escape SCBA
- Fully encapsulating, chemical-resistant suit
- Steel-toe leather boots
- Inner chemical-resistant gloves
- Outer chemical-resistant gloves

PPE must be inspected by the user prior to donning it and before entry into the zone. Items that are found to be defective will not be used.

Personnel required to wear respirators must have been trained and acceptably fit-tested for the assigned respirator, per the training and documentation requirements in Section 3 of this HSP. Requirements for respirator use, emergency use, storage, cleaning, and maintenance, as stated in the ANL-W *Environment, Safety and Health Manual* will be followed.

Table 10 lists each task or assignment and the corresponding level of PPE, as well as any additional or special items necessary for personal protection.

Table 10 Level of PPE Required for the five sites

Unit	Minimum PPE	Special Requirements
Ditch A	Level D/Level C if Dusty	
Ditch B	Level D/Level C if Dusty	addition of water as dust suppression
Main Cooling Tower Blowdown Ditch	Level D/Level C if Dusty	addition of water as dust suppression
Industrial Waste Lift Station Discharge Ditch	Level D/Level C if Dusty	
Interceptor Canal-Mound	Level D/Level C if Dusty	addition of water as dust suppression

9. DECONTAMINATION PROCEDURES

9.1 Decontamination (PPE Levels A and B)

If Level A or B PPE is required, then two decontamination stations will be used: one at the line between the exclusion zone and the contamination reduction corridor (Station A), and one at the contamination control line (Station B). Decontamination Station A supports personnel and equipment exiting the exclusion zone; this is where the most highly contaminated PPE and equipment is removed and cleaned. Persons assigned to work at this station must wear the same level of PPE as the persons who are exiting the exclusion zone.

Station B is where the last piece(s) of PPE is removed before entering the support zone. The recommended doffing order and some suggested procedures for exiting through a two-station decontamination process are:

INSIDE EXCLUSION ZONE AT POINT OF ENTRY:

1. Place tools and sampling equipment into appropriate storage containers
2. Wash and rinse boot covers and gloves
3. Remove tape
4. Remove boot covers, outer gloves, and hood

UPON STEPPING TO THE FIRST STATION (STATION A):

5. Wash and rinse suit and boots
6. Remove suit and respirator
7. Wash, rinse, and remove inner gloves
8. Remove inner coveralls

UPON STEPPING TO THE SECOND STATION:

9. Field wash/shower

IN LOCKER ROOM OR CHANGE AREA:

10. Put on personal clothing.

9.2 Single-Station Decontamination (PPE Level C)

When Level C PPE is required, the decontamination station should be located at the junction between the exclusion zone and the contamination reduction zone.

AT POINT OF ENTRY FROM EXCLUSION TO CONTAMINATION REDUCTION ZONE:

1. Drop tools and equipment into appropriate container(s)
2. Wash and rinse boot covers and gloves (if worn)
3. Remove tape
4. Remove boot covers and outer gloves
5. Wash, rinse, and remove boots and suit (if worn)
6. Remove and drop respirator
7. Wash, rinse, and remove inner gloves.

AT POINT OF ENTRY/EXIT FROM CONTAMINATION REDUCTION SUPPORT ZONE:

8. Remove coveralls

9. Field wash/shower

IN LOCKER ROOM OR CHANGE AREA:

10. Put on personal clothing,

9.3 Level D Decontamination

If Level D PPE is required, decontamination personnel will be required to use soap and water and wash all exposed skin (face, hands and arms) immediately after exiting the exclusion zone and before eating, drinking, smoking, etc.

9.4 Radiological Decontamination of Personnel

Radiological decontamination of personnel shall be done under the direct supervision of an ANL-W HPT or ANL-W HPE in accordance with the ANL-W *Radiological Control Manual*. Personnel and personal property decontamination procedures that may be used include: tape, vacuuming (vacuum must be equipped with a high-efficiency particulate air filter), washing with soap and water, or other approved techniques. All decontamination operations for equipment and areas shall be performed in accordance with the ANL-W *Radiological Control Manual* and ANL-W *Radiological Control Manual*.

9.4.1 Decontamination in Medical Emergencies

If a person is injured or becomes ill, the situation will be evaluated by first aid personnel. Medical care for serious injury will not be delayed for decontamination. In such cases, gross contamination may be removed by removing the injured person's outer protective gear (if possible). Additional decontamination may be performed at the medical facility. The ANL-W IH, ANL-W HPT, or the HSO (depending on the type of contamination) should accompany the employee to the medical facility to provide information and decontamination assistance to medical personnel. The DOE *Radiological Control Manual*, and ANL-W *Radiological Control Manual* contains information on the proper handling of radiologically contaminated wounds.

9.4.2 Equipment Decontamination and Disposal of Contaminated Materials

All equipment used during the remedial action activities will be decontaminated in accordance with the ANL-W Environmental Procedures Manual with the exception that the isopropanol will not be used. All investigation derived wastes will be handled according to the Management Plan for Control of Investigation Derived Wastes.

9.4.3 Site Sanitation and Waste Minimization

Personnel will use toilet facilities located at the gatehouse or otherwise designated wash room. Potable water and soap will also be available for the personnel to wash their hands and face upon exiting the work area. It is important to note that any required radiological contamination surveys must be performed prior to washing face and hands to prevent accidental spread of contamination.

Waste materials will not be allowed to accumulate at the five sites. Appropriate containers for contaminated and noncontaminated waste will be maintained at step-off areas, in the support zone, and at other appropriate locations ANL-W. All waste will be surveyed by the ANL-W HPT prior to removal from ANL-W. Personnel should make every attempt to minimize waste through judicious use of consumable materials. All personnel are expected to make good housekeeping a priority at the job site.

10. EMERGENCY RESPONSE PLAN FOR REMEDIAL ACTIVITIES

The method used at ANL-W to alert personnel of emergency signals is through the use of a siren and gong system. This siren and gong system is transmitted to buildings and also through speakers mounted outside buildings. The emergency signals used at ANL-W are; Slow-Whoop Fire Alarm, Site-Wide Evacuation, Criticality Alarm, and Security Alert Alarm. Each of these sirens and alarms are described below..

- Slow-Whoop Fire Alarm. Rapidly increasing whoops (sounded only in the affected facility); if in the affected facility, immediately evacuate and assemble upwind. All fire alarms will be followed by a site-wide PA announcement. Follow any specific instructions per the site-wide PA announcement.
 - Site-Wide Evacuation. An oscillating siren preceded by a site-wide PA announcement, All personnel must immediately evacuate the ANL-W site to the bus loading area by the most direct route (avoiding building with activated criticality alarms).
-

- Criticality Alarm. Flashing blue alarm light and three horn blasts in the affected facility with an associated site-wide PA announcement, stating the affected facility and assembly point. Immediately evacuate the affected facility; follow any specific instructions per the site-wide announcement.
- Security Alert Alarm. Steady siren followed by a site-wide PA announcement. All personnel must immediately go indoors, remain indoors and follow any specific instructions per the announcement. The Security Alert Alarm announcement will be preceded by the words: "This is a Security Alert...."

The ANL-W site also employs an emergency response number for any emergency. To report an emergency all an employee has to do is pick up the nearest telephone and dial 13. The employee will automatically be transferred to security, safety, medical, and fire crews.

Spill control will be handled by personnel directly involved, if the spills are small enough to be safely contained at the site. Radiological contamination in uncontrolled areas is considered a "spill." If any uncontrolled release of hazardous or radioactive material is noticed, personnel will initiate the SWIMS approach:

- Stop the spill using appropriate measures
- Warn area personnel
- Isolate the area
- Minimize exposure to the spill
- Secure any ventilation paths and ensure that an ANL-W HPT surveys the area to determine the extent of a radiological material spill.

10.1 Emergency Equipment on Site

Emergency response equipment that will be maintained at the site includes the items described in Table 11. The ANL-W Fire Department located at ANL-W is the closest emergency response team. Figure 5 shows the route to the nearest medical facility and locations of the nearby emergency response teams. An emergency drill will be conducted at the beginning of the task. The objective of the drill is to allow personnel an opportunity to practice their respective emergency response actions.

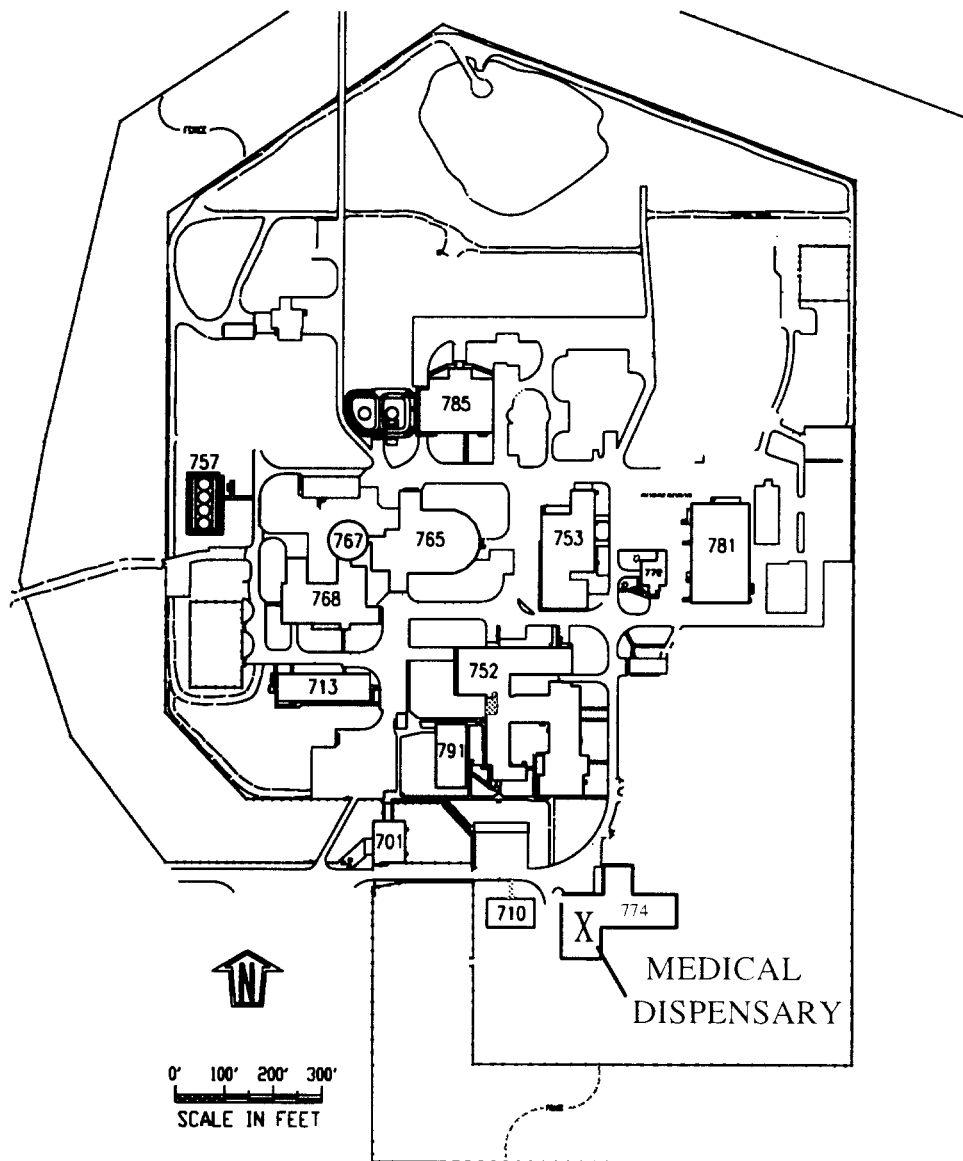
Table 11 Emergency Response Equipment Required			
Equipment Name	Quantity	Responsible Person	Frequency of Inspection
Fire extinguisher*	1/crew*	CERCLA Project Manager	per month
First aid kit	1/crew	CERCLA Project Manager	per month
Eye wash station	1/crew	CERCLA Project Manager	per month
Hazardous materials spill kit	1/crew	CERCLA Project Manager	per month

* Consult ANL-W fire protection engineer to determine appropriate type and quantity of fire extinguisher(s).

Each drill or actual emergency event at ANL-W will be followed by a critique, and any deficiencies in the emergency plan that are identified will be corrected.

10.2 Telephone/Radio contact Reference List

Table 11 lists the emergency/reference numbers to be used to perform the remediation of the five sites. This table will be posted at each sampling location.



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SITE-098.DWG (SITE-026)

Figure 5 Shows the route to the nearest medical facility.

Table 12 Emergency Telephone Number Reference List		
Responder	Contact	Number
ANL-W Area Emergency Action Director		dial 13
ANL-W First Aid		dial 13
ANL-W Security		dial 13
ANL-W Explosives Expert		dial 13
ANL-W Hazardous Material Team		dial 13
ANL-W Fire Protection Engineer	Roy Nelson	3-7576
ANL-W Safety Engineer	Roy Nelson	3-7576
ANL-W Industrial Hygienist	Shelly Havlovick	3-7653
ANL-W Health Physics Engineer	Larry Burke	3-7078
ANL-W Project Lead Engineer	Scott Lee	3-7829
ANL-W EWMP Manager	Pete Wells	3-7152

11. HEALTH AND SAFETY TRAINING ACKNOWLEDGMENT

The signatures below certify that:

- The employee has reviewed a copy of the health and safety plan for these five sites being remediated and questions and concerns regarding tasks and associated hazards have been answered to the employees satisfaction.
- The employee understands that hazards are or may be involved in work at each site (Section 7, "Hazard Evaluation" Tables 3 through 7 Task Activities and associated hazards.
- The employee agrees to comply with all requirements as outlined in this health and safety plan.
- The employee's training records have been verified as complete and current for the employee's assignment.

Employee's name (printed) and signature:

Name (Printed)	Signature	Date
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Organization:

ANL-W Industrial Hygienist

Name (Printed)	Signature	Date
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12. REFERENCES

ANL-W Radiological Control Manual, ANL-W current issue.

ANL-W General Employee Radiological Training (GERT), ANL-W current issue.

ANL-W Radiological Worker I (RW-I), ANL-W current issue.

ANL-W Radiological Worker II (RW-II), ANL-W current issue.

ANL-W General Employee Training (GET), ANL-W current issue.

NIOSH, 1985, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH/OSHA/USCG/EPA, DHHS (NIOSH) Publication No. 85-115, October.

Radiological Control Manual, U.S. Department of Energy Idaho Operations Office, current issue.

Environmental Restoration Health and Safety Plan (HASP) Guidelines, SAFT-0025, February 1994, Department of Energy Idaho Operations Office.

ANL-W *Environment, Safety and Health Manual*, ANL-W, current issue.

EG&G Environmental Restoration Standard Operating Procedures "*11.4 Field Decontamination of Heavy Equipment, Drill Rigs, and Drilling Equipment*" April 24, 1994.

EG&G Environmental Restoration Standard Operating Procedures "*11.5 Decontamination of Drilling Equipment*" April 25, 1994.

EG&G Environmental Restoration Standard Operating Procedures "*11.6 Decontamination of Sampling Equipment*" March 9, 1994.

Sciencetech Inc., Safety Analysis Review of Operable Unit 9-01, 9-03, and 9-04 sites at ANL-W. August 1994.

APPENDIX E
AIR MODELING

APPENDIX E

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Carcinogenic and Noncarcinogenic Emission Calculations for

OU 9-04 Remediation Activities

Scott Lee, MS Environmental Engineering.

Problem Statement:

IDAPA 16.01.01.585 and 586 requires that the carcinogenic and noncarcinogenic fugitive dust emissions released from a remedial activity are less than the stated limits. To complete the calculations of air emissions ANL-W used the fugitive dust equations that were previously used at OU 2-13. Although new air emission calculations for unpaved gravel roads became effective October 23, 1998, which is after the signed Record of Decision for WAG 9 September 27, 1998, a comparison of the old and new emission factors has been performed.

The OU 9-04 sites being remediated are:

- Ditch A
- Ditch B
- Main Cooling Tower Blowdown Ditch
- Interceptor Canal- Mound
- Industrial Waste Lift Station Discharge Ditch.

These sites will undergo either excavation and disposal of the soils or excavation and planting and harvesting activities. Empirical equations have not been developed to cover these specific tasks. However, DOE will use of existing empirical equations for activities that are similar to those being conducted at ANL-W. This “best fit” air modeling equations to work being conducted at ANL-W are the air emission calculations for unpaved roads and air emissions for aggregate handling. The unpaved roads equation seems to be the best fit for the use of farming implements driving across the sites while the aggregate handling equation will simulate the excavation and stockpiling of the soils prior to planting. The calculated particulate matter released from each of these processes will be added together to determine the particulate release by particle size and the total particulate release.

Activities will be performed at these sites during an 8 hour a day work shift. However, the determination of the 24-hour a day emissions will be determined by taking the 8-hour a day value and multiplying it by a factor of three. The 8-hour a day value is the air release for a site that is undergoing remediation. After the 8-hour work day is completed the site will stay in it's undisturbed state for 16 hours until the next work shift. Because of this, the 24-hour emission release is actually a very conservative value that will overestimate the actual air release.

References:

1. *Compilation of Air Pollutant Emission Factors, AP-42*, Fifth Edition, Volume I: *Stationary Point and Area Sources*, January 1995.
2. *Hazardous Waste TSD - Fugitive Particulate Matter Air Emissions Guidance Document*, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, EPA-450/3-89-019 (PB90-103250), May 1989.
3. *Climatology of the Idaho National Engineering Laboratory*, Second Edition, U.S. Department of Commerce, National Oceanic and Atmosphere Administration, Environmental Research Laboratories, Air Resources Laboratory, Field Research Division, December 1989.

Approach:

Use the methods discussed in Chapter 13 of Reference 1 for unpaved roads and aggregate handling and storage piles to estimate the fugitive particulate matter (PM) generated during the remediation of the sites. Calculate the PM_{30} , PM_{15} , PM_{10} , PM_5 , $PM_{2.5}$ distribution for the soil at the ANL-W facility. Then use the PM factors in the equations to determine the total dust emissions at the facility. The final step is to use the 95% upper confidence limit concentration for each contaminant to determine the emissions of each of the contaminants at each site.

Assumptions:

1. The remedial action will occur between April and October (214 days) in the year.
2. The silt loading or percent, in the soils around the ANL-W site only varies slightly between sites. ANL-W will use the average particle size distribution data from data collected in the Main Cooling Tower Blowdown Ditch.
3. The number of days that there was precipitation greater than 0.254 mm (0.01 in.) during the remediation period is the same as that listed in the Climatology report (Reference 3). This precipitation data was taken at the Central Facilities Area located approximately 10 miles West of ANL-W. A small variation in actual precipitation readings at the ANL-W facility will not greatly effect the results of air emission calculations.
4. The equipment used, number of wheels, and weight is the average of the equipment listed in Table 1. The type of equipment actually used in the field may vary slightly. These changes are not anticipated to effect the air emission calculations.
5. Increased wind erosion over a typical northern plain is minimal and is not included.
6. The unpaved vehicle miles traveled (VMT) over the contaminated site will be less than 0.5 (estimate by Scott Lee).

7. 10 cubic yards of material is transported per dump truck, two dump trucks per hour maximum, giving tons of material moved per hour equal to 20 (estimate by Scott Lee).
8. Density 1.6 g/cc or approximately 1.35 tons of material per cubic yard.
9. Silt content in soil 4.7%.
10. The aggregate handling and storage calculation will be used to determine the air emission for the excavation and disposal activities.
11. The air releases for the farming activities will be determined using the air emissions calculations for unpaved roads.

Table 1. Estimated equipment to be used.

Equipment	Number Wheels	Weight (lbs)	Number of Pieces
416B Backhoe Loader	4	13,700	1
950 Front End Loader	4	36,500	1
D6 Dozer	4 ^a	40,000	1
140H Grader	6	30,000	1
838 Soil Compactor	4	44,000	1
Dump Truck	10	50,000	2
Water Truck	10	50,000	1
Average	6.5	39,275 (19.64 T)	

a. Equivalent number of wheels

Vehicle Disturbance Equation:

Section 13.2.2, Unpaved Roads, of Reference 1 gives the following empirical expression for estimating the quantity of size specific particulate emissions from an unpaved road, per vehicle mile traveled:

$$E = k(5.9)(s/12)(S/30)(W/3)^{0.7}(\sqrt{w/4})((245-p)/245)(pounds/VM T) \quad \text{Equ. \#1}$$

where:

E = emission factor

k = particle size multiplier (dimension less)

s = silt content of road surface material (%)

S = mean vehicle speed, miles per hour (mph)

W = mean vehicle weight, ton (T)

w = mean vehicle wheels

p = number of days with at least 0.01 in. of precipitation during period.

The particle size multiplier, k is given Section 13.2.2 of Reference 1 as:

PM ₃₀	PM ₁₅	PM ₁₀	PM ₅	PM _{2.5}
0.80	0.50	0.36	0.20	0.095

The average silt content of the soils in question is 4.7%.

The mean vehicle speed used for these calculations is 15 mph on contaminated sites.

Table D-5, Reference 3, shows the percent of each month that has precipitation greater than 0.01 in. For the months of April through October, there are 41.6 days where the precipitation is greater than 0.01 in. at CFA, the closest station to ANL-W.

Material Transfer Equation:

Section 13.2.4, Aggregate Handling and Storage piles, of Reference 1 gives the following empirical expression for estimating the particulate emissions generated from a drop type operation per ton of material transferred:

$$E = k(0.0032) \left[(U/5)^{1.3} / (M/2)^{1.4} \right] (\text{pounds / ton}) \quad \text{Equ. \#2}$$

where:

E = emission factor

k = particle size multiplier (dimension less)

U = mean wind speed, miles per hour (mph)

M = material moisture content.

Section 13.2.4 of Reference 1 gives the particle size multiplier k, as:

PM ₃₀	PM ₁₅	PM ₁₀	PM ₅	PM _{2.5}
0.74	0.48	0.35	0.20	0.11

Table A-1, Reference 3, shows the monthly average wind speed and direction (quadrant) for the CFA 20 ft and 250 ft levels. For these calculation, the 20 ft level will be used. The average wind speed is determined by using the weighted-average of the months of April through October. This average wind speed is 8.2 mph from the WSW quadrant. The areas being remediated will have water applied to minimize the amount of dust released. ANL-W will use

6% moisture content for the soil which is a conservative estimate of the average moisture content of the soil being remediated.

Western Surface Coal Mining Equations

The activities being conducted at ANL-W during the removal of soil are similar in nature to activities conducted during surface coal mining throughout the Western United States. ANL-W has evaluated the air emission calculations and determined that the bulldozing (equation #3) and the grading (equation #4) emissions should be compared to those from the material transfer equation #2. The results of the comparison are shown in Table 2 and Table 2a.

Bulldozing of overburden

$$E = [5.7 * (s)^{1.2}] / (M)^{1.3} \text{ (pounds/hour)} \quad \text{Equ. \#3}$$

where:

s = material silt content (%)

M = material moisture content (%)

Grading

$$E = 0.040 (S)^{2.5} \text{ (pounds/VMT)} \quad \text{Equ. \#4}$$

where:

S = mean vehicle speed (MPH)

VMT = vehicle miles traveled

Calculations:

The contaminant releases for each site were determined by summing the emissions released to the air from equation 1 and equation 2 and equation 1, 3, and 4 for each particle size. The total emissions for a site was then multiplied by the percent of contaminant in the soil. This resulted in the pounds of contaminant being released. The pounds of the contaminant released was then divided by the number of hours necessary to complete the soil excavation at that site. This value in pounds per hour was then compared to those regulated in the IDAPA Section 585 and 586. Table 2 and 2a summarize releases for equation 1 and 2 and 1, 3, and 4 respectively along with the site, contaminants, and release information along with the regulated release concentrations found in Section 585 and 586 for noncarcinogenic and carcinogenic releases, respectfully.

Summary:

As shown in Table 2 and 2a, none of the air emissions exceeded those listed in Section 585 and 586 of IDAPA 16.01.01 for noncarcinogenic and carcinogenic contaminants. The air releases in Table 2a were higher than those calculated in Table 2 mainly because of the releases calculated from bulldozing activity. Screening emissions levels were used to conduct this

evaluation. The screening emission levels are based on an exposure of the contaminants at these concentrations for an eight hour work day. The screening emissions levels (EL eight hour exposure) were used instead of the acceptable ambient concentrations (AAC 24 hour exposure) because that represents the exposure that the worker will receive during the remediation. None of the contaminants would exceed the more stringent AAC concentrations but comparison of the actual releases over a eight hour work day to those of a twenty four hour exposure are unrealistic and therefor not used.

Table 2. Summary of calculated air concentration to release limits using Equ. 1 & 2.

Site	Calculations shown in	Contaminant	95% UCL Soil Concentration mg/kg	Equ. 1&2 8 hour Air Concentration lb/hr	24 hour Air Concentration lb/hr	IDAPA Emission level lb/hr
Ditch A	Table 3	mercury	3.94	7.23e-06	2.17e-05	7.00e-03
Ditch B	Table 4	chromium	1306	7.82e-04	2.34e-03	3.30e-02
Ditch B	Table 5	zinc	3020	1.81e-03	5.42e-03	6.67e-01
MCTBD ¹	Table 6	chromium	709	1.86e-04	5.57e-04	3.30e-02
MCTBD ¹	Table 7	mercury	8.83	2.31e-06	6.93e-06	7.00e-03
ILSDD ²	Table 8	silver	352	3.31e-04	9.94e-04	NA
Sewage Lagoons	Table 9	mercury	3.2	1.69e-07	5.06e-07	7.00e-03
IWP ³	Table 10	chromium	1030	1.24e-04	3.73e-04	3.30e-02
IWP ³	Table 11	mercury	2.62	3.16e-07	9.48e-07	7.00e-03
IWP ³	Table 12	selenium	8.41	1.01e-06	3.04e-06	1.30e-02
IWP ³	Table 13	zinc	5012	6.04e-04	1.81e-03	6.67e-01

Table 2a. Summary of calculated air concentration to release limits using Equ. 1, 3 & 4.

Site	Calculations shown in	Contaminant	95% UCL Soil Concentration mg/kg	Equ. 1, 3 & 4 8 hour Air Concentration lb/hr	Delta between using Equ. 2 vs. 3 & 4	Percent increase between Equ. 2 vs. 3 & 4
Ditch A	Table 3	mercury	3.94	8.43e-06	1.20e-06	14.27%
Ditch B	Table 4	chromium	1306	1.17e-03	3.91e-04	33.37%
Ditch B	Table 5	zinc	3020	2.71e-03	9.05e-04	33.37%
MCTBD ¹	Table 6	chromium	709	3.97e-04	2.11e-04	53.26%
MCTBD ¹	Table 7	mercury	8.83	4.94e-06	2.63e-06	53.26%
ILSDD ²	Table 8	silver	352	4.38e-04	1.06e-04	24.24%
Sewage Lagoons	Table 9	mercury	3.2	1.12e-06	9.51e-07	84.93%
IWP ³	Table 10	chromium	1030	4.31e-04	3.06e-04	71.17%
IWP ³	Table 11	mercury	2.62	1.10e-06	7.80e-07	71.17%
IWP ³	Table 12	selenium	8.41	3.52e-06	2.50e-06	71.17%
IWP ³	Table 13	zinc	5012	2.10e-03	1.49e-03	71.17%

1 (MCTBD) Main Cooling Tower Blowdown Ditch

2 (ILSDD) Industrial Waste Lift Station Discharge Ditch

3 (IWP) Industrial Waste Pond

Table 3. Estimated mercury emissions in Ditch A.

Length of site (ft)	4.00e+02				
Width of site (ft)	5.00e+00				
Depth of site (ft)	5.00e-01				
Mercury concentration in the soil (mg/kg)	3.94e+00				
Volume of contaminated soil (ft ³)	1.00e+03				
Weight of contaminated soil removed 1.6 g/cc (tons)	4.99e+01				
VMT (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	2.49e+00				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMT) Equ. #1*VMT	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	0.05	0.03	0.02	0.01	0.01
Emissions by size (lbs)	1.871	1.17	0.843	0.469	0.2236
Total emissions (lbs)	4.58e+00				
Total Mercury emission lbs = (lbs*cont. conc. unitless)	1.80e-05				
Contaminant concentration lbs/hr = (total mercury lbs / removal time hr)	7.23e-06				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	8.64e-01				
Grading (lb/VMT) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMT*VMT	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	8.84e-01				
Toal contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	2.10e-05				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	8.43e-06				

Table 4. Estimated chromium emissions in Ditch B.

Length of site (ft)	5.00e+02				
Width of site (ft)	5.00e+00				
Depth of site (ft)	1.30e+00				
Chromium concentration in the soil (mg/kg)	1.31e+03				
Volume of contaminated soil (ft ³)	3.25e+03				
Weight of contaminated soil removed 1.6 g/cc (tons)	1.62e+02				
VMT (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	8.11e+00				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMT) Equ. #1*VMT	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	0.157	0.102	0.07	0.04	0.023
Emissions by size (lbs)	1.979	1.241	0.894	0.498	0.2397
Total emissions (lbs)	4.85e+00				
Total Chromium emission lbs = (lbs*cont. conc. unitless)	6.34e-03				
Contaminant concentration lbs/hr = (total chromium lbs / removal time hr)	7.82e-04				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	2.81e+00				
Grading (lb/VMT) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMT*VMT	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	2.83e+00				
Total contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	9.51e-03				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	1.17e-03				

Table 5. Estimated zinc emissions in Ditch B.

Length of site (ft)	5.00e+02				
Width of site (ft)	5.00e+00				
Depth of site (ft)	1.30e+00				
Zinc concentration in the soil (mg/kg)	3.02e+03				
Volume of contaminated soil (ft ³)	3.25e+03				
Weight of contaminated soil removed 1.6 g/cc (tons)	1.62e+02				
VMТ (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	8.11e+00				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMТ) Equ. #1*VMТ	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	0.157	0.102	0.07	0.04	0.023
Emissions by size (lbs)	1.979	1.241	0.894	0.498	0.2397
Total emissions (lbs)	4.85e+00				
Total Zinc emission lbs = (lbs*cont. conc. unitless)	1.47e-02				
Contaminant concentration lbs/hr = (total zinc lbs / removal time hr)	1.81e-03				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	2.81e+00				
Grading (lb/VMТ) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMТ*VMТ	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	2.83e+00				
Total contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	2.20e-02				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	2.71e-03				

Table 6. Estimated chromium emissions in MCTBD.

Length of site (ft)	7.00e+02				
Width of site (ft)	6.00e+00				
Depth of site (ft)	2.00e+00				
Chromium concentration in the soil (mg/kg)	7.09e+02				
Volume of contaminated soil (ft ³)	8.40e+03				
Weight of contaminated soil removed 1.6 g/cc (tons)	4.19e+02				
VMT (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T)	2.10e+01				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMT) Equ. #1*VMT	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	0.406	0.263	0.192	0.11	0.06
Emissions by size (lbs)	2.228	1.402	1.012	0.565	0.2767
Total emissions (lbs)	5.48e+00				
Total chromium emission lbs = (lbs*cont. conc. unitless)	3.89e-03				
Contaminant concentration lbs/hr = (total chromium lbs / removal time hr)	1.86e-04				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	7.26e+00				
Grading (lb/VMT) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMT*VMT	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	7.28e+00				
Toal contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	8.32e-03				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	3.97e-04				

Table 7. Estimated mercury emissions in MCTBD.

Length of site (ft)	7.00e+02				
Width of site (ft)	6.00e+00				
Depth of site (ft)	2.00e+00				
Mercury concentration in the soil (mg/kg)	8.83e+00				
Volume of contaminated soil (ft ³)	8.40e+03				
Weight of contaminated soil removed 1.6 g/cc (tons)	4.19e+02				
VMT (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	2.10e+01				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMT) Equ. #1*VMT	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	0.406	0.263	0.192	0.11	0.06
Emissions by size (lbs)	2.228	1.402	1.012	0.565	0.2767
Total emissions (lbs)	5.48e+00				
Total mercury emission lbs = (lbs*cont. conc. unitless)	4.84e-05				
Contaminant concentration lbs/hr = (total mercury lbs / removal time hr)	2.31e-06				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	7.26e+00				
Grading (lb/VMT) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMT*VMT	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	7.28e+00				
Total contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	1.04e-04				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	4.94e-06				

Table 8. Estimated silver emissions in Industrial Waste Lift Station Discharge Ditch.

Length of site (ft)	5.00e+02				
Width of site (ft)	4.00e+00				
Depth of site (ft)	1.00e+00				
Silver concentration in the soil (mg/kg)	3.52e+02				
Volume of contaminated soil (ft ³)	2.00e+03				
Weight of contaminated soil removed 1.6 g/cc (tons)	9.98e+01				
VMT (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	4.99e+00				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMT) Equ. #1*VMT	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	0.1	0.06	0.05	0.03	0.014
Emissions by size (lbs)	1.919	1.202	0.866	0.482	0.2308
Total emissions (lbs)	4.70e+00				
Total silver emission lbs = (lbs*cont. conc. unitless)	1.65e-03				
Contaminant concentration lbs/hr = (total silver lbs / removal time hr)	3.31e-04				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	1.73e+00				
Grading (lb/VMT) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMT*VMT	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	1.75e+00				
Toal contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	2.18e-03				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	4.38e-04				

Table 9. Estimated mercury emissions in Sewage Lagoons.

Length of site (ft)	5.00e+02				
Width of site (ft)	5.00e+02				
Depth of site (ft)	2.00e+00				
Mercury concentration in the soil (mg/kg)	3.20e+00				
Volume of contaminated soil (ft ³)	5.00e+05				
Weight of contaminated soil removed 1.6 g/cc (tons)	2.49e+04				
VMT (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	1.25e+03				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMT) Equ. #1*VMT	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	24.14	15.66	11.42	6.525	3.5885
Emissions by size (lbs)	25.96	16.8	12.24	6.98	3.805
Total emissions (lbs)	6.58e+01				
Total mercury emission lbs = (lbs*cont. conc. unitless)	2.11e-04				
Contaminant concentration lbs/hr = (total mercury lbs / removal time hr)	1.69e-07				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	4.32e+02				
Grading (lb/VMT) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMT*VMT	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	4.32e+02				
Total contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	1.40e-03				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	1.12e-06				

Table 10. Estimated chromium emissions in Industrial Waste Pond.

Length of site (ft)	2.50e+02				
Width of site (ft)	2.00e+02				
Depth of site (ft)	5.00e-01				
Chromium concentration in the soil (mg/kg)	1.03e+03				
Volume of contaminated soil (ft ³)	2.50e+04				
Weight of contaminated soil removed 1.6 g/cc (tons)	1.25e+03				
VMT (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	6.24e+01				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMT) Equ. #1*VMT	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	1.207	0.783	0.571	0.326	0.1794
Emissions by size (lbs)	3.029	1.922	1.391	0.782	0.3958
Total emissions (lbs)	7.52e+00				
Total chromium emission lbs = (lbs*cont. conc. unitless)	7.75e-03				
Contaminant concentration lbs/hr = (total chromium lbs / removal time hr)	1.24e-04				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	2.16e+01				
Grading (lb/VMT) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMT*VMT	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	2.16e+01				
Total contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	2.69e-02				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	4.31e-04				

Table 11. Estimated mercury emissions in Industrial Waste Pond.

Length of site (ft)	2.50e+02				
Width of site (ft)	2.00e+02				
Depth of site (ft)	5.00e-01				
Mercury concentration in the soil (mg/kg)	2.62e+00				
Volume of contaminated soil (ft ³)	2.50e+04				
Weight of contaminated soil removed 1.6 g/cc (tons)	1.25e+03				
VMТ (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	6.24e+01				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMТ) Equ. #1*VMТ	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	1.207	0.783	0.571	0.326	0.1794
Emissions by size (lbs)	3.029	1.922	1.391	0.782	0.3958
Total emissions (lbs)	7.52e+00				
Total mercury emission lbs = (lbs*cont. conc. unitless)	1.97e-05				
Contaminant concentration lbs/hr = (total mercury lbs / removal time hr)	3.16e-07				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	2.16e+01				
Grading (lb/VMТ) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMТ*VMТ	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	2.16e+01				
Total contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	6.83e-05				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	1.10e-06				

Table 12. Estimated selenium emissions in Industrial Waste Pond.

Length of site (ft)	2.50e+02				
Width of site (ft)	2.00e+02				
Depth of site (ft)	5.00e-01				
Selenium concentration in the soil (mg/kg)	8.41e+00				
Volume of contaminated soil (ft ³)	2.50e+04				
Weight of contaminated soil removed 1.6 g/cc (tons)	1.25e+03				
VMT (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	6.24e+01				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMT) Equ. #1*VMT	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	1.207	0.783	0.571	0.326	0.1794
Emissions by size (lbs)	3.029	1.922	1.391	0.782	0.3958
Total emissions (lbs)	7.52e+00				
Total selenium emission lbs = (lbs*cont. conc. unitless)	6.32e-05				
Contaminant concentration lbs/hr = (total selenium lbs / removal time hr)	1.01e-06				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	2.16e+01				
Grading (lb/VMT) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMT*VMT	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	2.16e+01				
Total contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	2.19e-04				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	3.52e-06				

Table 13. Estimated zinc emissions in Industrial Waste Pond.

Length of site (ft)	2.50e+02				
Width of site (ft)	2.00e+02				
Depth of site (ft)	5.00e-01				
Zinc concentration in the soil (mg/kg)	5.01e+03				
Volume of contaminated soil (ft ³)	2.50e+04				
Weight of contaminated soil removed 1.6 g/cc (tons)	1.25e+03				
VMТ (vehicle mile traveled per hour)	5.00e-01				
T (tons of material moved per hour)	2.00e+01				
Time to remove contaminated soil (hr) = Weight/T	6.24e+01				
Calculations					
	PM-30	PM-15	PM-10	PM-5	PM-2.5
Unpaved road particulate emissions (lbs/VMТ) Equ. #1*VMТ	1.822	1.139	0.82	0.456	0.2164
Pickup and dropping emissions (lbs/tons) Equ. #2*tons	1.207	0.783	0.571	0.326	0.1794
Emissions by size (lbs)	3.029	1.922	1.391	0.782	0.3958
Total emissions (lbs)	7.52e+00				
Total zinc emission lbs = (lbs*cont. conc. unitless)	3.77e-02				
Contaminant concentration lbs/hr = (total zinc lbs / removal time hr)	6.04e-04				
Bulldozing overburden (lb/hr) Equ. #3	3.46e+00				
Bulldozing emissions (lbs) = lbs/hr*.10 time	2.16e+01				
Grading (lb/VMТ) Equ. #4	4.00e-02				
Grading emissions (lbs) = lb/VMТ*VMТ	2.00e-02				
Total emissions from Equ. 3+4 (lbs)=	2.16e+01				
Total contaminant emissions Equ. 1 + 3 + 4 (lbs*cont. conc. unitless)	1.31e-01				
Contaminant concentration lbs/hr = total lbs cont. / removal time hr)	2.10e-03				

Radionuclide Emission Calculations
For
OU 9-04 Remediation Activities

Scott Lee, MS Environmental Engineering

Problem Statement:

National Emission Standards for Emissions for Hazardous Air Pollutants is regulated under 40 CFR part 61. Subpart H regulates the national emission standards for emissions of radionuclides other than radon from Department of Energy facilities. 40 CFR 61.92 establishes that the emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/year.

To comply with the 40 CFR 61.92 emissions limit modeling of the radionuclides released during the remediation efforts was calculated. ANL-W used version 2.0 of the CAP 88-PC program to determine the effective dose equivalent released per year and compared it to the 10 mrem/year limit. Only one OU 9-04 site contains radionuclides that would be released during the farming operations associated with phytoremediation. The one site at OU 9-04 is the Interceptor Canal-Mound site.

CAP 88 Input:

1. The closest individual near the ANL-W site is located 8700 meters South Southwest.
2. The Cs-137 and the associated daughter Ba-137M (metastable) was used to determine the total emissions.
3. Climatic data used from nearest National Oceanic and Atmospheric Administration station located at ANL-W. Temperature average of 10 degrees c, precipitation of 25 cm/year, and mixing height of 1,000 meters. The ANL-W wind rose with the velocity of the wind at 10 meter height was used.
4. The source height used was 0 meters. The mound will be leveled to grade.
5. The surface area of 1858 square meters (40 ft x 500 ft).
6. Agricultural data used 0% fraction home produced vegetables, milk, and meat. This assumption is valid since no produce is grown at the site, no dairy is produced, and no beef is raised for consumption. All produce consumed at the ANL-W facility is transported to the ANL-W facility from other areas.

CAP 88 Run Printout:

The CAP 88 version 2.00 reports were run using the input parameters discussed above. The synopsis report, dose and risk equivalent summaries, and the CHI/Q tables report for the ANL-W CAP 88 PC modeling are shown in pages 3 through 16 of this report.

CAP 88 Results:

The results of the CAP 88-PC modeling resulted in $7.38\text{E-}05$ mrem/year effective dose equivalent from the Cs-137 and the Ba-137M released at ANL-W. This result is much lower than the 10 mrem/year limit for non radon DOE added releases. The CAP 88-PC modeling results indicate that the 40 CFR 61.92 limit will not be exceeded and the remediation effort can proceed without any other dust suppression activities being performed.

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment

Feb 2, 1999 03:54 pm

Facility: Interceptor Canal Mound Site
Address: Argonne National Laboratory
P.O. Box 2528
City: Idaho Falls
State: ID Zip: 83403-2528

Source Category: Release during farming activities
Source Type: Area
Emission Year: 1999

Comments: Interceptor canal mound site at ANL-W.
Phytoremediation Field Test

Effective Dose Equivalent
(mrem/year)

7.38E-05

At This Location: 8700 Meters South Southwest

Dataset Name: ANL-09 Mound
Dataset Date: Feb 2, 1999 03:54 pm
Wind File: C:\CAP88PC2\WNDFILES\ANLWG.WND

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8700 Meters South Southwest
Lifetime Fatal Cancer Risk: 1.77E-09

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	8.69E-05
BREAST	7.93E-05
R MAR	6.63E-05
LUNGS	6.54E-05
THYROID	8.20E-05
ENDOST	7.38E-05
RMNDR	6.57E-05
EFFEC	7.38E-05

RADIONUCLIDE EMISSIONS DURING THE YEAR 1999

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	
<hr/>				
CS-137	D	1.00	5.5E-04	5.5E-04
BA-137M	D	1.00	5.5E-04	5.5E-04

SITE INFORMATION

Temperature: 10 degrees C
 Precipitation: 25 cm/y
 Mixing Height: 1000 m

SOURCE INFORMATION

Source Number: 1

Source Height (m): 0.

Area (sq m): 1858.

Plume Rise							
Pasquill Cat:	A	B	C	D	E	F	G
Zero:	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	0.000	0.000	0.000
Fraction Imported:	1.000	1.000	1.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8700

Clean Air Act Assessment Package - 1988

D O S E A N D R I S K E Q U I V A L E N T S U M M A R I E S

Non-Radon Individual Assessment
Feb 2, 1999 03:54 pm

Facility: Interceptor Canal Mound Site
Address: Argonne National Laboratory
 P.O. Box 2528
City: Idaho Falls
State: ID Zip: 83403-2528

Source Category: Release during farming activities
Source Type: Area
Emission Year: 1999

Comments: Interceptor canal mound site at ANL-W.
Phytoremediation Field Test

Dataset Name: ANL-09 Mound
Dataset Date: Feb 2, 1999 03:54 pm
Wind File: C:\CAP88PC2\WNDFILES\ANLWG.WND

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)
GONADS	8.69E-05
BREAST	7.93E-05
R MAR	6.63E-05
LUNGS	6.54E-05
THYROID	8.20E-05
ENDOST	7.38E-05
RMNDR	6.57E-05
EFFEC	7.38E-05

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	0.00E+00
INHALATION	4.07E-07
AIR IMMERSION	1.90E-12
GROUND SURFACE	7.34E-05
INTERNAL	4.07E-07
EXTERNAL	7.34E-05
TOTAL	7.38E-05

NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclide	Selected Individual (mrem/y)
CS-137	4.07E-07
BA-137M	7.34E-05
TOTAL	7.38E-05

CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
LEUKEMIA	2.10E-10
BONE	1.31E-11
THYROID	3.73E-11
BREAST	3.11E-10
LUNG	3.24E-10
STOMACH	1.96E-10
BOWEL	9.74E-11
LIVER	2.14E-10
PANCREAS	1.28E-10
URINARY	8.04E-11
OTHER	1.57E-10
TOTAL	1.77E-09

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	0.00E+00
INHALATION	1.08E-11
AIR IMMERSION	4.56E-17
GROUND SURFACE	1.76E-09
INTERNAL	1.08E-11
EXTERNAL	1.76E-09
TOTAL	1.77E-09

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
CS-137	1.08E-11
BA-137M	1.76E-09
TOTAL	1.77E-09

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

Distance (m)

Direction 8700

N	5.3E-05
NNW	4.3E-05
NW	2.0E-05
WNW	2.5E-05
W	3.6E-05
WSW	5.3E-05
SW	7.0E-05
SSW	7.4E-05
S	4.1E-05
SSE	3.2E-05
SE	2.2E-05
ESE	2.2E-05
E	1.8E-05
ENE	4.3E-05
NE	6.0E-05
NNE	6.1E-05

INDIVIDUAL LIFETIME RISK (deaths)
(All Radionuclides and Pathways)

Distance (m)

Direction 8700

N	1.3E-09
NNW	1.0E-09
NW	4.8E-10
WNW	5.9E-10
W	8.6E-10
WSW	1.3E-09
SW	1.7E-09
SSW	1.8E-09
S	9.7E-10
SSE	7.6E-10
SE	5.2E-10
ESE	5.2E-10
E	4.2E-10
ENE	1.0E-09
NE	1.4E-09
NNE	1.5E-09

Clean Air Act Assessment Package - 1988

C H I / Q T A B L E S

Non-Radon Individual Assessment
Feb 2, 1999 03:54 pm

Facility: Interceptor Canal Mound Site
Address: Argonne National Laboratory
 P.O. Box 2528
City: Idaho Falls
State: ID Zip: 83403-2528

Source Category: Release during farming activities
Source Type: Area
Emission Year: 1999

Comments: Interceptor canal mound site at ANL-W.
 Phytoremediation Field Test

Dataset Name: ANL-09 Mound
Dataset Date: Feb 2, 1999 03:54 pm
Wind File: C:\CAP88PC2\WNDFILES\ANLWG.WND

GROUND-LEVEL CHI/Q VALUES FOR CS-137
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)	
<hr/>	
Dir	8700
<hr/>	
N	6.826E-08
NNW	5.563E-08
NW	2.686E-08
WNW	3.265E-08
W	4.732E-08
WSW	6.853E-08
SW	8.926E-08
SSW	9.333E-08
S	5.225E-08
SSE	4.052E-08
SE	2.716E-08
ESE	2.790E-08
E	2.181E-08
ENE	5.424E-08
NE	7.490E-08
NNE	7.726E-08

GROUND-LEVEL CHI/Q VALUES FOR BA-137M
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir 8700

N	3.115E-11
NNW	1.301E-11
NW	4.294E-12
WNW	6.016E-12
W	6.332E-12
WSW	1.061E-11
SW	1.846E-11
SSW	3.579E-11
S	2.001E-11
SSE	1.161E-11
SE	6.148E-12
ESE	5.014E-12
E	4.946E-12
ENE	9.439E-11
NE	1.637E-10
NNE	7.063E-11

APPENDIX F
SCHEDULES

APPENDIX F
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Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
0010	WAG 9 ROD	1	29SEP88A	29SEP88A
0015	RD/RA SOW	65*	14SEP88A	17NOV88A
0020	ANL-W PREPARES DRAFT RD/RA SOW	10	14SEP88A	16OCT88A
0030	ANL-W SUBMITS DRAFT RD/RA SOW TO DOE	1	15OCT88A	16OCT88A
0040	DOE REVIEWS DRAFT RD/RA SOW	1	16OCT88A	19OCT88A
0050	ANL-W REVISES DRAFT RD/RA SOW	1	16OCT88A	19OCT88A
0060	DOE SUBMITS DRAFT RD/RA SOW TO EPA/IDHW	1	19OCT88A	20OCT88A
0070	EPA/IDHW REVIEWS DRAFT RD/RA SOW	9	20OCT88A	30OCT88A
0080	EPA/IDHW COMMENTS ON DRAFT RD/RA SOW TO DOE	1	29OCT88A	30OCT88A
0090	ANL-W REVISES DRAFT RD/RA SOW	7	31OCT88A	06NOV88A
0100	DOE SUBMITS DRAFT FINAL RD/RA SOW TO EPA/IDHW	3	07NOV88A	09NOV88A
0110	EPA/IDHW REVIEWS DRAFT FINAL RD/RA SOW	9	09NOV88A	17NOV88A
0120	WAG 9 RD/RA SOW GOES FINAL	1	17NOV88A	17NOV88A
0125	PHYTO BENCH SCALE REPORT	75*	01OCT88A	14DEC88A
0130	ANL-W/ANL-E PREPARES PHYTO BENCH SCALE REPORT	35	01OCT88A	30OCT88A
0140	DOE SUBMITS PHYTO BENCH SCALE REPORT TO EPA/IDHW	1	05NOV88A	06NOV88A
0150	EPA/IDHW REVIEW PHYTO BENCH SCALE REPORT	13	05NOV88A	17NOV88A
0160	EPA/IDHW COMMENTS ON PHYTO SUBMITTED TO DOE	1	17NOV88A	17NOV88A
0170	ANL-W/ANL-E MEETING PHYTO BENCH SCALE REPORT	1	17NOV88A	18NOV88A
0180	ANL-W/ANL-E-W/DOE/EPA/IDHW PRESENT PHYTO TO CAB	1	17NOV88A	18NOV88A
0190	ANL-W/ANL-E REVISES PHYTO BENCH SCALE REPORT	15	17NOV88A	01DEC88A
0200	DOE SUBMITS FINAL PHYTO B/S/SCALE REPORT/EPA/IDHW	1		07DEC88A
0210	EPA/IDHW REVIEW PHYTO BENCH SCALE REPORT	7		14DEC88A
0220	PHYTO BENCH SCALE REPORT GOES FINAL	1		14DEC88A
0225	REMEDIAL DESIGN (RD)	368*	07DEC88A	09DEC99
0230	ANL-W PREPARES DRAFT RD	70	07DEC88A	14FEB89A
0235	MEETING WITH WAG MANAGEMENT IN BOISE	2	26JAN89A	27JAN89A
0240	ANL-W SUBMITS DRAFT RD	1	14FEB89A	14FEB89A
0250	DOE REVIEWS DRAFT RD	15	15FEB89A	01MAR89A
0260	ANL-W REVISES DRAFT RD	8	02MAR89A	09MAR89A
0270	DOE SUBMITS DRAFT RD TO EPA/IDHW	1	09MAR89A	09MAR89A
0280	EPA/IDHW REVIEW DRAFT RD	31	09MAR89A	08APR89A
0290	EPA/IDHW COMMENTS/DRAFT RD TO DOE	1	08APR89A	08APR89A

Sheet 1 of 5

ARGONNE NATIONAL LABORATORY
WORKING SCHEDULE

F-3

WAGS

Project Start	12OCT88	Early Bar
Project Finish	01JUL04	Progress Bar
Data Date	21OCT88	Critical Activity
Run Date	22OCT88	

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Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
0300	ANL-W REVISES DRAFT RD	30	08APR99A	07MAY99A
0310	DOE SUBMITS DRAFT FINAL RDEPA/IDHW	1	07MAY99A	07MAY99A
0320	EPA/IDHW REVIEW DRAFT FINAL RD	8	08MAY99A	15MAY99A
0330	WAG 9 RD GOES FINAL	1	09DEC99*	09DEC99
0331	ANL-W PREPARES DRAFT ESD	10	15MAY99A	31MAY99A
0332	ANL-W SUBMITS DRAFT ESD TO DOE	1	01JUN99A	01JUN99A
0333	DOE REVIEWS DRAFT ESD	1	01JUN99A	05JUN99A
0334	ANL-W REVISES DRAFT ESD	1	05JUN99A	25JUN99A
0335	DOE SUBMITS DRAFT ESD TO EPA/IDHW	1	28JUN99A	29JUN99A
0336	EPA/IDHW REVIEWS DRAFT ESD	9	28JUN99A	14JUL99A
0337	EPA/IDHW COMMENTS ON DRAFT ESD TO DOE	1	14JUL99A	14JUL99A
0338	ANL-W REVISES DRAFT ESD	28	14JUL99A	17NOV99
0339	DOE SUBMITS DRAFT FINAL ESD TO EPA/IDHW	1	18NOV99	18NOV99
0341	EPA/IDHW REVIEWS DRAFT FINAL ESD	12	18NOV99	29NOV99
0342	WAG 9 ESD GOES FINAL	1	01DEC99	01DEC99
0343	PROCUREMENT PHYTO SUBCONTRACTOR FOR FY 99	117	02MAR99A	26JUN99A
0350	PREPARE CONTRACT SOW	30	04JAN99A	02FEB99A
0360	MEET WITH ANL-W/PROCUREMENT DISCUSS SOW	1	03FEB99A	03FEB99A
0370	PROCEED WITH ANL-E PROCUREMENT APPROVAL	15	08FEB99A	22FEB99A
0380	PREPARE HEALTH AND SAFETY PLAN	19	22FEB99A	01MAR99A
0390	PREPARE BID VENDOR LIST	8	02MAR99A	09MAR99A
0400	PREPARE COMPLETE BID PACKAGE	20	02MAR99A	21MAR99A
0410	SUBMIT BID PACKAGE TO VENDORS	1	21MAR99A	21MAR99A
0420	ANSWER BID QUESTIONS FROM VENDORS	24	21MAR99A	13APR99A
0430	CONDUCT PRE-BID TOUR WITH VENDORS	1	05APR99A	05APR99A
0440	BID PACKAGES DUE TO PROCUREMENT DEPARTMENT	1	13APR99A	13APR99A
0450	OPEN BID PACKAGES	1	13APR99A	13APR99A
0460	EVALUATE BID PACKAGES	8	13APR99A	20APR99A
0470	AWARD CONTRACT	1	20APR99A	20APR99A
0480	START FIELD PREPARATION ACTIVITIES/FENCE/SIGNS	1	04MAY99A	04MAY99A
0490	PLANT FIRST PHYTOREMEDIATION CROP FY 99	220	05MAY99A	10DEC99A
0500	INSTALL IRRIGATION EQUIPMENT	22	21MAY99A	11JUN99A
0510	APPLY SOIL AMENDMENTS	64	19JUN99A	21AUG99A
0520	HARVEST ABOVE AND BELOW GROUND PLANTS	5	10SEP99A	14SEP99A
0530	DRY PLANT MATTER INSIDE FENCED AREA	7	18SEP99A	24SEP99A
0540	BALE UP DRY PLANT MATTER	5	24SEP99A	28SEP99A

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
0550	PREPARE BALES FOR SHIPMENT TO INCINERATOR	25	24SEP99A	18OCT99A
0560	COMPLETE RRWAC DOCUMENTATION	26	21OCT99	15NOV99
0570	SHIP WASTES TO INCINERATOR	29	15NOV99	13DEC99
0580	COMPLETE WASTE ANALYSIS ON RESULTANT ASH	39	21JAN00*	28FEB00
0581	EXCAVATION AND DISPOSAL	306*	01OCT99A	01AUG00
0582	PREPARE PAPERWORK TO IMPLEMENT CONTINGENT REMEDY	194	01OCT99A	01MAY00
0583	START EXCAVATION ACTIVITIES	1	01MAY00	01MAY00
0584	MOVE SOIL TO LANDFILL	30	02MAY00	31MAY00
0585	COMPLETE EXCAVATION OF SITES	1	31MAY00	31MAY00
0586	LEAVE SITES OPEN PENDING VERIFICATION RESULTS	49	01JUN00	19JUL00
0587	BACKFILL WITH CLEAN SOIL	13	20JUL00	01AUG00
0590	REPLANT SEEDS FOR NEXT SPRING	5	21OCT99	25OCT99
0600	DECISION ON EXTENSION OF PHYTO CONTRACT	1	13DEC99	13DEC99
0610	PLANT SECOND PHYTOREMEDIATION CROP FY 00	218	17MAY00*	20DEC00
0620	INSTALL IRRIGATION EQUIPMENT	22	31MAY00*	21JUN00
0630	APPLY SOIL AMENDMENTS	65	28JUN00	31AUG00
0640	HARVEST ABOVE AND BELOW GROUND PLANTS	5	18SEP00	22SEP00
0650	DRY PLANT MATTER INSIDE FENCED AREA	10	25SEP00	04OCT00
0660	BALE UP DRY PLANT MATTER	5	04OCT00	08OCT00
0670	PREPARE BALES FOR SHIPMENT TO INCINERATOR	24	04OCT00	27OCT00
0680	COMPLETE RRWAC DOCUMENTATION	27	27OCT00	22NOV00
0690	SHIP WASTES TO INCINERATOR	29	22NOV00	20DEC00
0700	COMPLETE WASTE ANALYSIS ON RESULTANT ASH	39	21JAN01	28FEB01
0710	COLLECT SOIL SAMPLES FOR ANALYSIS OF PHYTOREMEDI	5	04OCT00	08OCT00
0720	SUBMIT SOIL SAMPLES TO ANALYTICAL LABORATORY	1	08OCT00	08OCT00
0730	ANALYSIS OF SOIL SAMPLES	54	08OCT00	30NOV00
0740	RETURN OF SAMPLE RESULTS TO ANL-W	1	30NOV00	30NOV00
0750	COMPILE SAMPLE DATA RESULTS/STATISTICS	15	30NOV00	14DEC00
0755	INTERIM RA REPORT REPORT	77*	14DEC00	28FEB01
0760	PREPARE ANL-W PHYTOREMEDIATION INTERIM RA REPORT	46	14DEC00	28JAN01
0770	SUBMIT ANL-W PHYTO INTERIM RA REPORT EPA/IDHW	2	28JAN01	29JAN01
0780	EPA/IDHW REVIEW OF INTERIM RA REPORT	23	29JAN01	20FEB01
0790	EPA/IDHW COMMENTS DUE TO DOE	1	20FEB01	20FEB01
0800	ANL-W/ANL-E/DOE/EPA/IDHW MEETING	1	28FEB01	28FEB01
0810	DECISION ON CONTINUING WITH PHYTOREMEDIATION	1	28FEB01	28FEB01
0820	PLANT PHYTOREMEDIATION CROP FY 01	218	17MAY01*	20DEC01

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
0830	INSTALL IRRIGATION EQUIPMENT	22	31MAY01	21JUN01
0840	APPLY SOIL AMENDMENTS	65	28JUN01	31AUG01
0850	HARVEST ABOVE AND BELOW GROUND PLANTS	5	24SEP01	28SEP01
0860	DRY PLANT MATTER INSIDE FENCED AREA	5	01OCT01	05OCT01
0870	BALE UP DRY PLANT MATTER	5	08OCT01	12OCT01
0880	PREPARE BALES FOR SHIPMENT TO INCINERATOR	22	08OCT01	29OCT01
0890	COMPLETE RRWAC DOCUMENTATION	25	29OCT01	22NOV01
0900	SHIP WASTES TO INCINERATOR	29	22NOV01	20DEC01
0910	COMPLETE WASTE ANALYSIS ON RESULTANT ASH	39	21JAN02	28FEB02
0920	PLANT PHYTOREMEDIATION CROP FY 02	218	17MAY02*	20DEC02
0930	INSTALL IRRIGATION EQUIPMENT	22	31MAY02	21JUN02
0940	APPLY SOIL AMENDMENTS	65	28JUN02	31AUG02
0950	HARVEST ABOVE AND BELOW GROUND PLANTS	5	23SEP02	27SEP02
0960	DRY PLANT MATTER INSIDE FENCED AREA	8	30SEP02	07OCT02
0970	BALE UP DRY PLANT MATTER	5	07OCT02	11OCT02
0980	PREPARE BALES FOR SHIPMENT TO INCINERATOR	22	07OCT02	28OCT02
0990	COMPLETE RRWAC DOCUMENTATION	26	28OCT02	22NOV02
1000	SHIP WASTES TO INCINERATOR	29	22NOV02	20DEC02
1010	COMPLETE WASTE ANALYSIS ON RESULTANT ASH	39	21JAN03	28FEB03
1020	PLANT PHYTOREMEDIATION CROP FY 03	218	17MAY03*	20DEC03
1030	INSTALL IRRIGATION EQUIPMENT	22	31MAY03	21JUN03
1040	APPLY SOIL AMENDMENTS	65	28JUN03	31AUG03
1050	HARVEST ABOVE AND BELOW GROUND PLANTS	5	20SEP03	24SEP03
1060	DRY PLANT MATTER INSIDE FENCED AREA	8	27SEP03	04OCT03
1070	BALE UP DRY PLANT MATTER	5	04OCT03	08OCT03
1080	PREPARE BALES FOR SHIPMENT TO INCINERATOR	25	04OCT03	28OCT03
1090	COMPLETE RRWAC DOCUMENTATION	26	28OCT03	22NOV03
1100	SHIP WASTES TO INCINERATOR	29	22NOV03	20DEC03
1110	COMPLETE WASTE ANALYSIS ON RESULTANT ASH	39	21JAN04	28FEB04
1120	COLLECT SOIL SAMPLES FOR ANALYSIS OF PHYTOREMEDI	5	04OCT03	08OCT03
1130	SUBMIT SOIL SAMPLES TO ANALYTICAL LABORATORY	1	08OCT03	08OCT03
1140	ANALYSIS OF SOIL SAMPLES	54	08OCT03	30NOV03
1150	RETURN OF SAMPLE RESULTS TO ANL-W	1	30NOV03	30NOV03
1160	COMPILE SAMPLE DATA RESULTS/STATISTICS	15	30NOV03	14DEC03
1165	O&M REPORT	201*	14DEC03	01JUL04
1170	PREPARE ANL-W O&M DRAFT REPORT	46	14DEC03	28JAN04

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	
1180	SUBMIT ANL-W O&M DRAFT REPORT TO EPA/IDHW	1	28FEB04	28FEB04	⊗
1190	EPA/IDHW REVIEW OF O&M DRAFT REPORT	45	01MAR04	14APR04	⊗
1200	EPA/IDHW COMMENTS DUE TO DOE	1	14APR04	14APR04	⊗
1210	ANL-W REVISES THE DRAFT O&M REPORT	48	14APR04	31MAY04	⊗
1220	DOE SUBMITS DRAFT FINAL O&M REPORT TO EPA/IDHW	1	31MAY04	31MAY04	⊗
1230	EPA/IDHW REVIEW OF DRAFT FINAL O&M REPORT	1	01JUN04	01JUN04	⊗
1240	O&M REPORT GOES FINAL	1	01JUL04	01JUL04	⊗

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish	RESP
0010	SURVEY AREA & MARK UNDERGROUND UTILITIES	2	2	01APR99*	02APR99	PS
0020	PHYSICAL REMOVAL COBBLES/ROCKS/REBAR FROM DITCH	5	5	05APR99	09APR99	PS
0030	MOVE POWER CABLE TO WEIR & VALVE CONTROL BOX	5	5	05APR99	09APR99	PS
0040	REGRADE THE DITCH BOTTOMS AND SIDES	6	6	16APR99*	23APR99	MH
0050	USE RIPPER&PLOW TO PREPARE DITCH FOR PLANTING	6	6	23APR99	30APR99	MH
0060	PHYSICAL REMOVAL OF COBBLES & ROCKS FROM DITCH	6	6	30APR99	07MAY99	PS
0070	USE ROTOTILLER TO PREPARE SOIL FOR PLANTING	5	5	07MAY99	13MAY99	MH
0080	PLACE FENCE POSTS EVERY 50 ft AROUND SITES	6	6	07MAY99	14MAY99	PS
0090	INSTALL SIGNS TO FENCE POSTS FACING OUT	6	6	07MAY99	14MAY99	PS
0100	12in AUGER/DRILL HOLES 18in APART 14in DEEP	11	11	14MAY99	28MAY99	MH
0110	PLANT TREES INTO AUGER HOLES	11	11	14MAY99	28MAY99	PS
0120	PLANT TREES WHERE TREES HAVE DIED (5%)	6	6	15JUN99*	22JUN99	PS
0130	PLANT TREES WHERE TREES HAVE DIED (5%)	15	15	24MAY00*	13JUN00	PS
0140	EXTRACT DEAD TREES AND ROOTS	6	6	02OCT00*	09OCT00	MH
0150	RUN DEAD TREES THROUGH CHIPPER VOLUME REDUCTION	11	11	02OCT00	16OCT00	PS
0160	CHIPPED WOOD LOADED INTO LLW BOX(S)/COMPACTION	11	11	02OCT00	16OCT00	PS
0170	TRANSPORT LLW BOX(S) TO WEIR	6	6	04DEC00*	11DEC00	MH

Project Start 23FEB99

Project Finish 11DEC00

Data Date 01APR99

Run Date 24FEB99

23FEB99

01APR99

11DEC00

Early Bar

Progress Bar

Critical Activity

Sheet 1 of 1

ARGONNE NATIONAL LABORATORY
PHYTOREMEDIATION OF DITCH A
WORKING SCHEDULE

F-8

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Activity		Activity Description		Orig Dur	Rem Dur	Early	RESP
0010	REMOVE ALL SOIL IN DITCH TO BEDROCK(PAY-LOADER)	8	8 01SEP99*	10SEP99	MH		
0020	FILL DUMP TRUCKS/COVER/DELIVER CENTRAL FACILITIE	8	8 01SEP99	10SEP99	MH		
0030	REMOVE SOIL AROUND CULVERTS/TOP OF BASALT	8	8 01SEP99	10SEP99	PS		
0040	PHOTOGRAPH EXCAVATION SHOWING TOP OF BASALT	1	1 10SEP99	10SEP99	EH		
0050	CLEAN ALL EQUIPMENT ON DECONTAMINATION PAD	1	1 10SEP99	10SEP99	MH		
0060	BACKFILL DITCH WITH CLEAN FILL MATERIAL	5	5 13SEP99	17SEP99	MH		
0070	REGRADE DITCH WITH SLOPE SOUTH TO WEST	5	5 13SEP99	17SEP99	MH		

1999

SEP

13

6

20

Sheet 1 of 1

ARGONNE NATIONAL LABORATORY
EXCAVATION/DISPOSAL DITCH B SOILS
WORKING SCHEDULE

F-9

DITB



Project Start 01SEP99
Project Finish 17SEP99
Data Date 01SEP99
Run Date 24FEB99

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish	RESP ORG
0010	DISCONNECT POWER TO WEIR IN DITCH	1	1	01APR99*	01APR99	PS
0020	MAKE 80 PLASTIC SIGNS TO MARK SITES	20	20	01APR99	28APR99	PS
0030	PHYSICAL REMOVAL OF WEIR IN DITCH/STAGED REUSE	6	6	02APR99	09APR99	MH
0040	REMOVE VEGETATION&LARGER ROCKS(BOX/BAG RELOCATE)	6	6	09APR99	16APR99	MH
0050	REGRADE DITCH BOTTOMS & SIDES	6	6	16APR99	23APR99	MH
0060	PREPARE DITCH FOR PLANTING	6	6	23APR99	30APR99	MH
0070	PHYSICAL REMOVAL OF COBBLES & ROCKS FROM DITCH	6	6	30APR99	07MAY99	PS
0080	USE ROTOTILLER TO PREPARE SOIL FOR PLANTING	5	5	07MAY99	13MAY99	MH
0090	PLACE FENCE POSTS EVERY 50 ft AROUND SITES	6	6	07MAY99	14MAY99	PS
0100	INSTALL SIGNS TO FENCE POSTS FACING OUT	6	6	07MAY99	14MAY99	PS
0110	12in AUGER/DRILL HOLES 18in APART 14in DEEP	11	11	14MAY99	28MAY99	MH
0120	PLANT TREES INTO AUGER HOLES	11	11	14MAY99	28MAY99	PS
0140	PLANT TREES WHERE TREES HAVE DIED (5%)	16	16	24MAY99*	14JUN99	PS
0130	PLANT TREES WHERE TREES HAVE DIED (5%)	6	6	15JUN99*	22JUN99	PS
0150	EXTRACT DEAD TREES AND ROOTS	6	6	02OCT00*	09OCT00	MH
0160	RUN DEAD TREES THROUGH CHIPPER VOLUME REDUCTION	11	11	02OCT00	16OCT00	PS
0170	CHIPPED WOOD LOADED INTO LLW BOX(S)/COMPACTION	11	11	02OCT00	16OCT00	PS
0180	TRANSPORT LLW BOX(S) TO WERF	6	6	04DEC00*	11DEC00	MH



Project Start

23FEB99

Project Finish

11DEC00

Data Date

01APR99

Run Date

24FEB99

Early Bar

Progress Bar

Critical Activity

23FEB99

11DEC00

01APR99

24FEB99

ARGONNE NATIONAL LABORATORY

PHYTOREMEDIATION SOILS COOLING TOWER

WORKING SCHEDULE

Sheet 1 of 1

F-10

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Activity ID	Activity Description	Orig Dur		Rem Dur		Early Start		Early Finish		RESP ORG
		8	8	8	8	01SEP99	01SEP99	10SEP99	10SEP99	
0010	REMOVE ALL SOIL IN DITCH TO BEDROCK(PAY-LOADER)									MH
0020	FILL DUMP TRUCKS/COVER/DELIVER CENTRAL FACILITIE									MH
0030	REMOVE SOIL AROUND CULVERTS/TOP OF BASALT									PS
0040	PHOTOGRAPH EXCAVATION SHOWING TOP OF BASALT									EH
0050	CLEAN ALL EQUIPMENT ON DECONTAMINATION PAD									MH
0060	BACKFILL DITCH WITH CLEAN FILL MATERIAL									MH
0070	REGRADE DITCH WITH SLOPE SOUTH TO WEST									MH

1999
SEP
13

20

ARGONNE NATIONAL LABORATORY
EXCAVATION/DISPOSAL COOLING TOWER DI
WORKING SCHEDULE

Sheet 1 of 1

F-11



Project Start
Project Finish
Data Date
Run Date

Activity ID	Activity Description	Orig Dur	Ram Dur	Early Start	Early Stop	RFSP	ORG	1999											
								APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV				
0010	GRADE MOUND SOUTH/NORTH APPROXIMATELY 2' THICK	7	7	01APR99	09APR99		MH												
0020	GRADE CLEAR ZONE 60' AROUND SOUTH/WEST/NORTH	7	7	01APR99	09APR99		MH												
0030	PLACE PLANT MATTER IN DUMPSTER/TRANSPORT CENTRAL	1	1	09APR99	09APR99		PS												
0040	USE RIPPER&PLOW TO PREPARE DITCH FOR PLANTING	6	6	16APR99*	23APR99		MH												
0050	PHYSICAL REMOVAL OF COBBLES & ROCKS FROM DITCH	6	6	23APR99	30APR99		PS												
0060	USE ROTOTILLER TO PREPARE SOIL FOR PLANTING	5	5	07MAY99	13MAY99		MH												
0070	PLACE FENCE POSTS EVERY 50 ft AROUND SITES	6	6	07MAY99	14MAY99		PS												
0080	INSTALL SIGNS TO FENCE POSTS FACING OUT	6	6	07MAY99	14MAY99		PS												
0090	BROADCAST SPREADER DISTRIBUTE KOSHIA SCOPARIA SE	1	1	14MAY99	14MAY99		PS												
0100	DRAG 20' CHAIN/2 PEOPLE 14' APART OVER NEW SEED	1	1	17MAY99	17MAY99		PS												
0110	CUT THE KOSHIA SCOPARIA WITH CYCLE MOWER	1	1	20JUL99*	20JUL99		PS												
0120	TURN THE CUT KOSHIA SCOPARIA WITH A RAKE	1	1	23JUL99*	23JUL99		MH												
0130	BALE THE KOSHIA SCOPARIA WITH BAILER	1	1	26JUL99*	26JUL99		MH												
0140	ROTOTILL TO A 2" DEPTH ON MOUND	1	1	26JUL99	26JUL99		MH												
0150	BROADCAST SPREADER DISTRIBUTE KOSHIA SCOPARIA SE	1	1	26JUL99	26JUL99		PS												
0160	DRAG 20' CHAIN/2 PEOPLE 14' APART OVER NEW SEED	1	1	27JUL99	27JUL99		PS												
0170	CUT THE KOSHIA SCOPARIA WITH CYCLE MOWER	1	1	04OCT99*	04OCT99		PS												
0180	TURN THE CUT KOSHIA SCOPARIA WITH A RAKE	1	1	08OCT99*	08OCT99		MH												
0190	BALE THE KOSHIA SCOPARIA WITH BAILER	1	1	12OCT99*	12OCT99		MH												
0200	REMOVE ROOTS FROM SOIL WITH VINE LIFTER	1	1	12OCT99	12OCT99		MH												
0210	BALE THE KOSHIA SCOPARIA ROOTS WITH BAILER	1	1	22OCT99*	22OCT99		MH												

Project Start Project Finish Data Date Run Date	01APR99 22OCT99 01APR99 24FEB99		ICMO	ARGONNE NATIONAL LABORATORY PHYTOREMEDIATION INTERCEPTOR CANAL M WORKING SCHEDULE	Sheet 1 of 1	F-12
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Activity		Activity Description		Org	Rem	Est	Enty	RESP
ID				Dur	Dur			ORG
0010		DISCONNECT POWER TO WEIR IN DITCH		1	1	01APR99*	01APR99	PS
0020		MAKE 80 PLASTIC SIGNS TO MARK SITES		20	20	01APR99	28APR99	PS
0030		PHYSICAL REMOVAL OF WEIR IN DITCH/STAGED REUSE		6	6	02APR99	09APR99	MH
0040		REMOVE VEGETATION&LARGER ROCKS(BOX/BAG RELOCATE)		6	6	09APR99	16APR99	MH
0050		REGRADE DITCH BOTTOMS & SIDES		6	6	16APR99	23APR99	MH
0060		PREPARE DITCH FOR PLANTING		6	6	23APR99	30APR99	MH
0070		PHYSICAL REMOVAL OF COBBLES & ROCKS FROM DITCH		6	6	30APR99	07MAY99	PS
0080		USE ROTOTILLER TO PREPARE SOIL FOR PLANTING		5	5	07MAY99	13MAY99	MH
0090		PLACE FENCE POSTS EVERY 50 ft AROUND SITES		6	6	07MAY99	14MAY99	PS
0100		INSTALL SIGNS TO FENCE POSTS FACING OUT		6	6	07MAY99	14MAY99	PS
0110		12in AUGER/DRILL HOLES 18in APART 14in DEEP		11	11	14MAY99	28MAY99	MH
0120		PLANT TREES INTO AUGER HOLES		11	11	14MAY99	28MAY99	PS
0140		PLANT TREES WHERE TREES HAVE DIED (5%)		16	16	24MAY99*	14JUN99	PS
0130		PLANT TREES WHERE TREES HAVE DIED (5%)		6	6	15JUN99*	22JUN99	PS
0150		EXTRACT DEAD TREES AND ROOTS		6	6	02OCT00*	09OCT00	MH
0160		RUN DEAD TREES THROUGH CHIPPER VOLUME REDUCTION		11	11	02OCT00	16OCT00	PS
0170		CHIPPED WOOD LOADED INTO LLW BOX(S)/COMPACTION		11	11	02OCT00	16OCT00	PS
0180		TRANSPORT LLW BOX(S) TO WERF		6	6	04DEC00*	11DEC00	MH

1999 2000

M A M J J A S O N D J F M A M J J A

Sheet 1 of 1

ARGONNE NATIONAL LABORATORY
PHYOREMEDIATION SOIL AT ANL-35
WORKING SCHEDULE

F-13

ANL3



Project Start 23FEB99
Project Finish 23FEB99
Data Date 24FEB99
Run Date

APPENDIX G
PARTS AND EQUIPMENT

APPENDIX G

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ANL DITCH A

ITEM #	ITEM DESCRIPTION	QUANTITY
1.	1-1/2 Poly Pipe	480 feet
2.	½ shrub adapter	37 ea.
3.	Rainbird MPR 15" H 30 psi 14" Rad 26 pm	37 ea.
4.	1-1/2 x ½ Saddle	37 ea.
5.	½ x 18" Sch 80 PUC Nip	37 ea.
6.	1-1/2 male adapter IN	4 ea.
7.	1-1/2 PUC Cap TH	2 ea.
8.	Sakes and Ties	37 ea.
9.	Nel 30 PSI Reg's	37 ea.
10.	½ x 3/4 Reducer Bushing	74 ea.
11.	½ x CL Sch 80 PUC Nip	37 ea.
12.	2" Hose Clamps	8 ea.
13.	3/4 ch 200 PUC	100 ft.

ANL 01A - MAIN COOLING TOWER DITCH

ITEM #	ITEM DESCRIPTION	QUANTITY
1.	2" Poly Pipe	900 ft.
2.	½ shrub adapter	35 ea.
3.	Rainbird MPR 15' H 30 psi 14' Rad 2 gpm	35 ea.
4.	2" x ½ Saddle	35 ea.
5.	2" Male Adapter IN	2 ea.
6.	2" PUC Cap TH	1 ea.
7.	½ x 18" Sch 80 PUC Nip	35 ea.
8.	Stakes and Ties	35 ea.
9.	Nels 30 psi Regs	35 ea.
10.	½ x 3/4 Red Bush PUC	70 ea.
11.	½ x CL Sch 80 PUC Nip	35 Ea.
12.	2" Hose clamp	4 ea.
13.	3/4 Ch 200 PUC	600 ft.

ANL 09-MOND

ITEM #	ITEM DESCRIPTION	QUANTITY
1.	3" X 40' LAT ER Ringlock w/clamp	17 Juts
2.	3"X 40' LAT ER Ringlock w/clamp	16 Juts
3.	3/4" x 72" Riser and coupler	16 ea.
4.	3" SREP	1 ea.
5.	R-2000 WF Wind fighter	16 ea.
6.	3" SRWFL 45° Elbow	3 ea.
7.	Nel 50 psi Regs.	16 ea.
8.	Stakes and Ties	16 ea.
9.	3" MIPT x 3" SRWF	1 ea.
10.	3/4" CL 200 PUC	900 feet

ANL NORTH DITCH - 35

ITEM #	ITEM DESCRIPTION	QUANTITY
1.	2" Poly Pipe	500 ft.
2.	3" x 40' LAT ER Ringlock w/clamp	7 ea.
3.	Rainbird MPR 15' H 30 psi 14' Rad 2gpm	34 ea.
4.	2" x ½ Saddle	34 ea.
5.	2" Malel Adapter In	4 ea.
6.	½ x 18" Sch 80 PUC Nip	34 ea.
7.	2" PUC Cap TH	2 ea.
8.	Stakes and Tie's	34 ea.
9.	Nel 30 psi Regs	34 ea.
10.	3/4 x ½ Red Bush PUC	68 ea.
11.	½ x Cl Sch 80 PUC Nip	34 ea.
12.	2" Hose clamp	8 ea.
13.	3" tec Ringlock	1 ea.
14.	3/f CL 200 PUC	440 ft.

ANL IWP INDUSTRIAL WASTE POND

ITEM #	ITEM DESCRIPTION	QUANTITY
1.	4" x 40' SRL WV w/ clamp	1240 ft.
2.	3" x 40' LAT ER Ringlock w/clamp	81 Jut
3.	R-2000 LOF Wind Fighter	81 ea.
4.	4" x 3" SRVL	8 ea.
5.	3" SREP	8 ea.
6.	4" SRMFL 45° Elbow	4 ea.
7.	NEL 50 psi Regs	81 ea.
8.	Stakes & Ties	81 ea.
9.	3/4 CL 200 PUC	1200 ft.

FIRE HYDRANT MANIFOLD

ITEM #	ITEM DESCRIPTION	QUANTITY
1.	3" Ball Valve	3 ea.
2.	2-1/2 Nst x 3" NPT Red	2 ea.
3.	3" Galv Tee	7 ea.
4.	DCV Backflow Preventer w/Gate Valve	1 ea.
5.	3" x 4" Reducer Bush	1 ea.
6.	3" x 2" Reducer Bush	3 ea.
7.	2" Elec. Valve	4 ea.
8.	3" Elec. Valve	1 ea.
9.	2" Ball Valve	4 ea.
10.	3" x 12" Galv. Nip	3 ea.
11.	3" x 3" Galv. Nip	6 ea.
12.	2" x 6" Galv Nip	8 ea.
13.	3" Pressure Reducing Valve 105/70	1 ea.
14.	55 Gal Poly Tank	1 ea.
15.	Injector Pump 1 gph/30 gph	1 ea.
16.	1" Check Valve	1 ea.

IRRIGATION COMPUTER CONTROL

ITEM #	ITEM DESCRIPTION	QUANTITY
1.	Dynamet Weather Station. 2m Station with DNX10 Data Logger Sensors. Include Pyranometer, Wind Speed and Direction, Tipping Bucket Rain Gauge, Air and Soil Temp, Relative Humidity (Vaisala). Batter and Charger weather-proof enclosure, Penman ETP Data Retrieval and Analysis Software.	1 ea.
2.	16 Channel Multiplexer	1 ea.
3.	Flow Meter	1 ea.
4.	Modem/cell phone interface controller. 2400 BAUD modem, Antenna, Misc mounting bracket assembly, power kit, pole mount kit, 10' cable and weather station. User to supply cellular phone and service.	1 ea.
5.	ML2 Theta Soil Moisture Probe. If more sensors needed add a AM416 multiplexer.	10 ea.
6.	Extra cable for Theta Probe.	2650 ft.
7.	Engineering and Programming of valve actuation and Hardware (relay, etc.) to operate irrigation according to soil moisture.	1 ea.
8.	Installation and training if needed, \$750 per day. \$700 est travel expenses.	1 ea.

PHYTOREMEDIATION PROJECT EQUIPMENT

ITEM #	ITEM DESCRIPTION	QUANTITY
1.	Roto Tiller used on Case 2290	1 ea.
2.	Ripper Long Shank to 30" used on Case 2290	1 ea.
3.	Plow 1 bottom used on Case 2290	1 ea.
4.	JD 328 bailer or equivalent to be used on Case 2290	1 ea.
5.	Bailer twine	1 ea.
6.	Vine lift used on Case 2290	1 ea.
7.	Wood Chipper	1 ea.
8.	Fence Posts	100 ea.
9.	Signs	100 ea.
10.	Complete Irrigation System	1 ea.
11.	Chemical Injection System Manifold	1 ea.
12.	Irrigation Control/Weather System	1 ea.
13.	3' Prairie Cascade Willow Bare Root	830 ea.
14.	4' Prairie Cascade Willow Bare Root	1198 ea.
15.	5' Prairie Cascade Willow Bare Root	2220 ea.
16.	Koshia Scoparia Seed (20 lbs)	20 lbs.
17.	Ammonium Fertilizer	1 ea.
18.	EDTA	1 ea.
19.	Citric Acid	1 ea.
20.	Digital Soil Moisture Meter (77378)	1 ea.
21.	Greenhouse soil test kit (77355)	1 ea.
22.	4 x 4 x 6 Compactable box	6 ea.
23.	Cargo Container	2 ea. no charge

APPENDIX H

Institutional Control Plan for Waste Area Group 9 (Operable Unit 9-04)

This Institutional Control Plan is being written to comply with the Environmental Protection Agency Region 10 draft Guidelines for Institutional Controls as part of CERCLA remedies under the INEEL FFA/CO, dated March 1999. This Institutional Control Plan describes non-engineered measures that will prevent inadvertent human or animal exposure to residual contaminants remaining in those sites at WAG 9 that have undergone a remedial action. These measures include posted warning signs, permanent markers, procedures, training and legal land use restriction documents filed with local government agencies. The measures will be applied to those waste site areas that will retain sufficient amounts of contaminants after remedial actions to prevent unrestricted use of the areas by future workers, residents or ecological receptors.

1. Background

1.1 Description of WAG 9 Waste Sites Requiring Remediation

Industrial Waste Pond

The Industrial Waste Pond (ANL-01) is an unlined, approximately 1.2-ha (3-acre) evaporative seepage pond fed by the Interceptor Canal and various industrial wastewater and stormwater drainage ditches. The pond was excavated in 1959, obtained a maximum water depth of about 4 m (13 ft) in 1988, and is still in use today. The pond is expected to go dry in 2002 or 2003 with the termination of cooling water discharges from the Sodium Process Facility. Contaminants of concern are cesium-137, chromium III, mercury, selenium, and zinc.

Ditch A

Ditch A (ANL-01) conveyed industrial wastewater from the EBR-II Power Plant auxiliary cooling tower to the Industrial Waste Pond. Ditch A is still being used today to transport storm water runoff as well as intermittent auxiliary cooling tower waters. Discharges to Ditch A flow into the Main Cooling Tower Blowdown Ditch and ultimately into the Industrial Waste Pond. The contaminant of concern is mercury.

Ditch B

Ditch B was also used to transport storm water runoff as well as wastewater from the EBR-II Power Plant and the Fire Station (Bldgs. 768 and 759) to the Industrial Waste Pond. Ditch B consists of two portions; an open portion and buried portion. The open portion consists of a small 125 feet portion of Ditch B which is still being used today. The buried portion (1,275 feet) of Ditch B was backfilled with clean soil to a depth of

approximately 5-feet during the installation of a second (outer) security fence. Contaminants of concern are chromium III and zinc.

Main Cooling Tower Blowdown Ditch

The Main Cooling Tower Blowdown Ditch (ANL-01A) flows north on the westside of the Main Cooling Tower and then north between the security fences to the Industrial Waste Pond. It is an unlined channel approximately 700 feet in length and 3 to 15 feet wide. From 1962 to 1996, the ditch had been utilized to convey industrial wastewater from the Cooling Tower to the Industrial Waste Pond. The main sources of nonradioactive impurities to the Industrial Waste Pond were water treatment chemicals used for the regeneration of backwash waters from the ion exchange resin beds and also the extracted minerals from cooling tower water used in the EBR-II steam system. From 1962 to July 1980, a chromate-based corrosion inhibitor was added to the Cooling Tower water and the resulting "blowdown" water contained significant quantities of hexavalent chromium. In the EBR-II Power plant, ion exchange column regeneration discharges occurred from 1962 to March 1986. Regeneration of these columns was accomplished with sulfuric acid (for cation columns) and sodium hydroxide (for anion columns). The Power Plant periodically discharged acidic liquids to the Main Cooling Tower Blowdown Ditch until 1986. Contaminants of concern are chromium III and mercury:

Sewage Lagoons

The sanitary Sewage Lagoons (ANL-04) are located at the Sanitary Sewage Treatment Facility, north of the ANL-W facility. Two lagoons were constructed in 1965, with a third built later in 1974. The three sanitary sewage lagoons cover approximately two acres. Appendix B shows a figure of the three lagoons with dimensions of; (1) 150 x 150 x 7 feet, (2) 50 x 100 x 7 feet, and (3) 125 x 400 x 7 feet. The lagoons receive all sanitary wastewater originating at ANL-W, with the exception of the Transient Reactor Test Facility, Sodium Process Facility, and the Sodium Components Maintenance Shop. Sanitary waste discharged is from rest rooms, change facilities, drinking fountains, and the Cafeteria. The three lagoon bottoms are sealed with a 0.125 to 0.25-inch layer of bentonite and are situated approximately 640 feet above the groundwater. The Sewage Lagoons are still in use and will continue to be used for disposal of sanitary wastes for an estimated 34 years (until 2033). The contaminant of concern is mercury.

Interceptor Canal-Canal

The canal portion was used to transport industrial wastewater to the Industrial Waste Pond and to divert spring runoff and stormwater around the ANL-W facility for flood control. Between 1962 and 1975, two 4-in. pipes transported liquid industrial wastes and cooling tower effluent, to the Interceptor Canal. One line transported cooling tower blowdown water and regeneration effluent while the other line originated at the Industrial Waste Lift Station (Bldg. 760) and transported industrial wastes. Liquid radioactive wastes were discharged through the same line as the industrial wastes, but they were diverted to the EBR-II Leach Pit. Discharge of industrial wastes was

discontinued in 1973, and discharge of cooling tower blowdown water to the canal was discontinued in 1975. The canal still serves as a diversion ditch for spring runoff and stormwater. The contaminant of concern is cesium-137.

Interceptor Canal-Mound

During clean out operations at the Interceptor Canal in October 1969, abnormal background radioactivity was detected. Additional radiation surveys in 1969, 1973, and 1975 indicated that the entire length of the Interceptor Canal was contaminated. Approximately 1,810 yd³ of this soil remains in a 500 ft long mound located immediately to the west of the canal. This mound of soil is the ANL-09-Interceptor Canal-Mound and was investigated as part of the RI/FS process. The mound is approximately 500 ft. long 20 ft. wide and 4 ft. deep. The contaminant of concern is cesium-137.

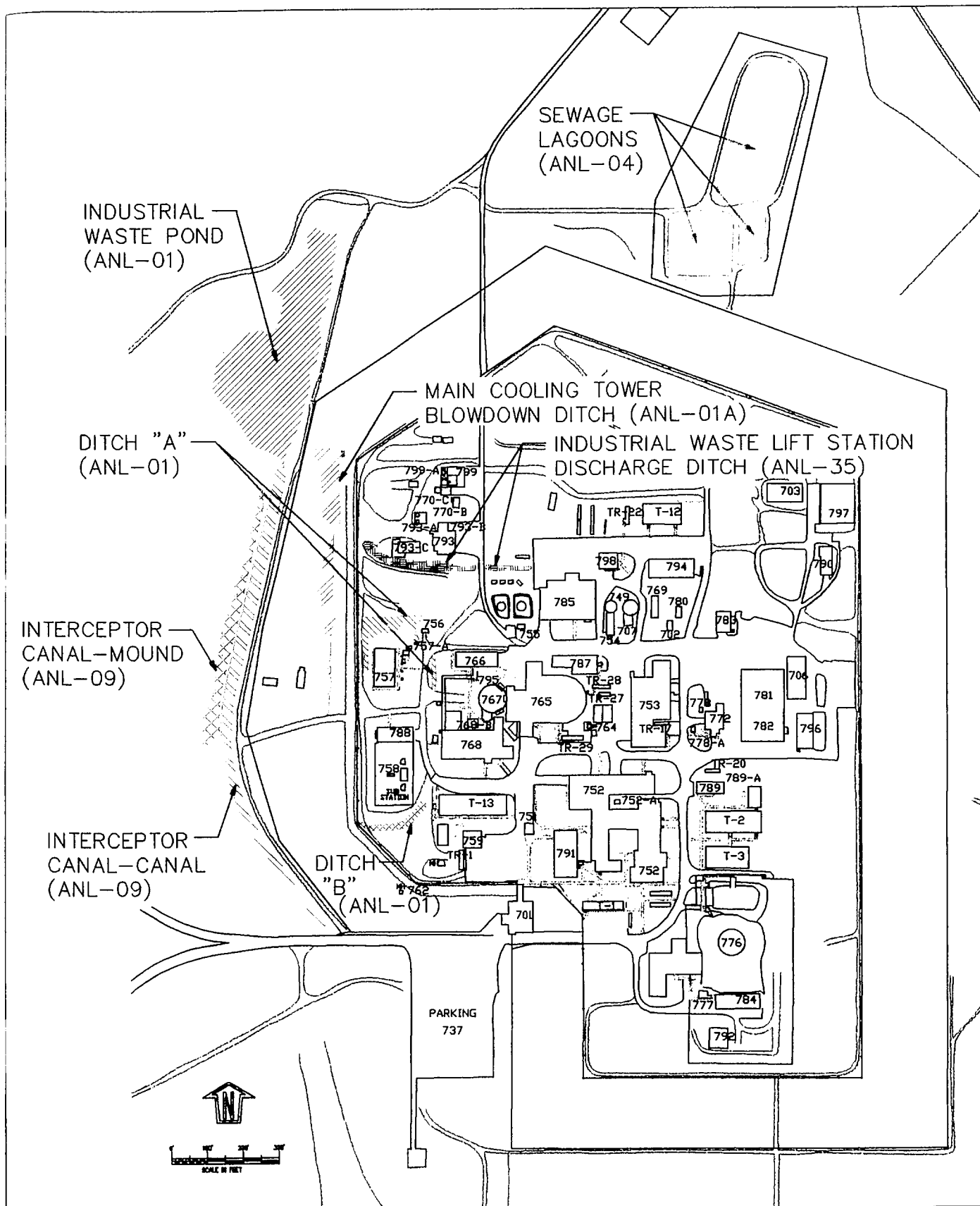
Industrial Waste Lift Station Discharge Ditch

The Industrial Waste Lift Station Discharge Ditch (ANL-35), also known as the “North Ditch”, is located inside the ANL-W security fences. The ditch is approximately 500 feet in length with a bottom width of 3 to 4 feet. At any given time, there is approximately 2 to 3 inches of water in the ditch. The ditch receives industrial waste water, primarily cooling water and photo processing wastes (e.g., photo developers, fixers, and stabilizers, and acids). Historical discharges included several retention tank overflows that may have contained ethanol, sodium hydroxide, and some radionuclides from a variety of facilities at ANL-W. The contaminant of concern is silver.

2. History of the Record of Decision (ROD) and Remediation Activities for Waste Area Group 9

The ANL-W OU 9-04 Comprehensive RI/FS evaluated the risks associated with the 37 sites from WAG 9 along with two sites from WAG 10. From 1992 to 1997, these 39 sites were evaluated to determine the risks to the current and future receptor scenarios.

Eight areas at ANL-W have actual or threatened releases of hazardous substances, which, if not addressed by implementing the response actions selected in the ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. These eight areas are; the Industrial Waste Pond (ANL-01), Ditch A (ANL-01), open portion of Ditch B (ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A). The Sanitary Sewage Lagoons (ANL-04), the Interceptor Canal-Canal (ANL-09), the Interceptor Canal-Mound (ANL-09), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). Figure H-1 shows the general location of these sites in relation to the ANL-W facility. Table H-1 identifies these eight sites and indicates if the cleanup is driven by the human health or the ecological risks. The survey plats of these eight areas with unacceptable human health or ecological risks will be included as Attachment I of this Institutional Control Plan.



FILE NAME: SITE-182.DWG
SHERRI L. PALMER 8-18-98

The Baseline Risk Assessment (BRA) for WAG 9 indicated that for the current and future occupational scenario, only one contaminant, cesium-137, would produce an unacceptable risk to human health. The cesium-137 posed an unacceptable risk to both current and future occupational receptors and future residential receptors at two sites, the Industrial Waste Pond (ANL-01) and the Interceptor Canal-Mound (ANL-09). The cesium-137 at the Interceptor Canal-Canal (ANL-09) site poses an unacceptable risk for the current and future occupational receptors, but not for future (beyond 100 year) residents. This is because the cesium in the canal will radioactively decay to harmless (unrestricted use) levels in about 90 years. The Interceptor Canal-Canal (ANL-09) risks will be mitigated for the current and future occupational receptors by implementation of the land use restrictions during the 100-years of DOE control.

The results of the WAG 9 ERA indicate that of the 37 WAG 9 release sites and the 2 WAG 10 sites, only six areas produce potentially unacceptable risks for ecological receptors due to the presence of various inorganic contaminants. These six areas are; the Industrial Waste Pond, Ditch A, open portion of Ditch B (all from ANL-01), the Main Cooling Tower Blowdown Ditch (ANL-01A), the Sewage Lagoons (ANL-04), and the Industrial Waste Lift Station Discharge Ditch (ANL-35). The remaining sites that were evaluated as part of the OU 9-04 Comprehensive RI/FS have risks that were within the acceptable range of the National Contingency Plan.

None of the contaminants exceeded the hazard index of 1 for either the current or future occupational exposure route. The response actions selected in the ROD are designed to reduce the potential threats to human health and the environment to acceptable levels. The ROD was signed by the DOE, State of Idaho, and EPA Region 10 on September 29, 1998.

Table H-1 SITES WITH UNACCEPTABLE HUMAN HEALTH OR ECOLOGICAL RISKS.

ANL-W Area/Site Code	Human Health Risk?	Ecological Risk?
Industrial Waste Pond / (ANL-01)	Yes*	Yes*
Ditch A / (ANL-01)	No	Yes
Open portion Ditch B / (ANL-01)	No	Yes
Buried portion Ditch B / (ANL-01)	No	No
Main Cooling Tower Blowdown Ditch (ANL-01A)	No	Yes
Sewage Lagoons / (ANL-04)	No	Yes
Interceptor Canal-Canal / (ANL-09)	Yes	No
Interceptor Canal-Mound / (ANL-09)	Yes	No
Industrial Waste Lift Station Discharge Ditch / (ANL-35)	No	Yes

*This is the only site with both human health and ecological risks.

The Table H-2 lists all waste sites that were investigated as part of the comprehensive Remedial Investigation for Waste Area Group 9. The table includes the remedy selected by the three agencies (DOE, State of Idaho, and EPA) in the Record of Decision:

Table H-2 Waste Area Group 9 Waste Sites and Remedies

<u>Site Code</u>	<u>Operable Unit</u>	<u>Site Name</u>	<u>ROD Selected Remedy</u>
ANL-10	None	Dry Well between T-1 and ZPPR Mound	No Action
ANL-11	None	Waste Retention Tank	No Action
ANL-12	None	Suspect Waste Retention Tank by 793	No Action
ANL-14	None	Septic Tank and Drain Fields (2) by 753	No Action
ANL-15	None	Dry Well by 768	No Action
ANL-16	None	Dry Well by 759 (2)	No Action
ANL-17	None	Dry Well by 720	No Action
ANL-18	None	Septic Tank and Drain Field by 789	No Action
ANL-20	None	Septic Tank and Drain Field by 793	No Action
ANL-21	None	TREAT Suspect Waste Tank and Leaching Field (Non-Radioactive)	No Action
ANL-22	None	TREAT Septic Tank and the current Leaching Field	No Action
ANL-23	None	TREAT Seepage Pit and Septic Tank West of 720	No Action
ANL-24	None	Lab and Office Acid Neutralization Tank	No Action

ANL-25	None	Interior Building Coffin Neutralization Tank	No Action
ANL-26	None	Critical Systems Maintenance Degreasing Unit	No Action
ANL-27	None	Plant Services Degreasing Unit	No Action
ANL-32	None	TREAT Control Building 721 Septic Tank and Leach Field (Present)	No Action
ANL-33	None	TREAT Control Building 721 Septic Tank and Seepage Pit	No Action
ANL-04	9-01	ANL Sewage Lagoons	Phytoremediation deferred to end of operations in 2033.
ANL-19	9-01	Sludge Pit West of T-7 (Imhoff Tank)	No Action
ANL-28	9-01	EBR-II Sump	No Action
ANL-29	9-01	Industrial Waste Lift Station	No Action
ANL-30	9-01	Sanitary Waste Lift Station	No Action
ANL-36	9-01	TREAT Photo Processing Discharge Ditch	No Action
ANL-60	9-01	Knawa Butte Debris Pile	No Action
ANL-61+	9-01	EBR-II Transformer Yard	No Action
ANL-61A+	9-01	PCB-contaminated soil Adjacent to ANL-61	No Action
ANL-62	9-01	Sodium Boiler Building (766) Hotwell	No Action
ANL-63	9-01	Septic Tank 789-A	No Action
ANL-08	9-02	EBR-II Leach Pit	No Action

		(Radioactive)	
ANL-05	9-03	ANL Open Burn Pits #1, #2, and #3	No Action
ANL-31	9-03	Industrial/ Sanitary Waste Lift Station (Industrial Side Not Used)	No Action
ANL-34	9-03	Fuel Oil Spill by Building 755	No Action
ANL-01	9-04	Industrial Waste Pond and Ditches A, B, and C)	Phytoremediation of Industrial Waste Pond, and Ditch A. Excavation and disposal of Soils in Ditch B (open portion only). No Action for Ditch C.
ANL-01A	9-04	Main Cooling Tower Blowdown Ditch	Phytoremediation of west portion. Excavation and Disposal of east portion.
ANL-09	9-04	ANL Interceptor Canal –Canal and -Mound	Phytoremediation of Interceptor Canal-Mound. Institutional Controls for Interceptor Canal-Canal during radioactive decay of cesium.
ANL-35	9-04	Industrial Waste Lift Station Discharge Ditch	Phytoremediation
ANL-53	9-04	Cooling Tower Riser Pits	No Action
	10-06*	ANL-W Windblown Soils	No Action
	10-06*	ANL-W Stockpile Soils	No Action

+ ANL-61 and ANL-61A are counted as one site that has undergone two phases of cleanup.

- These OU 10-06 sites were included in the 9-04 RI/FS.

3. Future scenarios

Three future scenarios are presented as the most likely for future control of the ANL-W site (WAG 9). These likely scenarios are:

- ANL-W will stay under DOE control while remediation is occurring
- ANL-W will continue to be a nonresidential facility and will be under DOE control for approximately 100 years after the Remediation Goals (RGs) are met
- Or, DOE relinquishes control of the WAG 9 land areas to another government agency, such as the Department of the Interior, at a point in time before Remedial Action Objectives (RAOs) are met.

Each of these three scenarios have been evaluated for the impending controls. Tables H-3, H-4, and H-5 identify the restriction, land use control objectives, control procedures, surveillance to assure controls are in place, surveillance procedures, and response to failed controls for each of these likely scenarios.

Table H-3 Institutional Controls Required by the ROD.

<u>Waste Site Code</u>	<u>Waste Site Name</u>	<u>Timeframe of Land Use Restrictions (from 1999)</u>	<u>Review Period</u>	<u>Institutional Controls</u>
ANL-09	Interceptor Canal-Mound	Max of 105 years is expected	5 year reviews	1. Access restrictions (e.g. fences, posted signs, and permanent markers) to prevent residential intrusion. 2. Periodic inspection & maintenance to ensure integrity of institutional controls.
ANL-09	Interceptor Canal-Canal	Max of 88 years is expected	5 year reviews	1. Access restrictions (e.g. fences, posted signs, and permanent markers) to prevent residential intrusion. Periodic inspection & maintenance to ensure integrity of institutional controls.
ANL-01	Industrial Waste Pond	Max of 110 years is expected	5 year reviews	1. Access restrictions (e.g. fences, posted signs, permanent markers) to prevent residential intrusion. 2. Periodic inspection & maintenance to ensure integrity of institutional controls.
ANL-01	Ditch B (buried portion)	Max of 110 years is expected	5 year reviews	1. Maintain existing fencing, access and excavation controls.
ANL-01	Ditch B (open portion)	Expected to be less than 2 years	5 year reviews	1. Maintain existing fencing and access controls until remedy is complete.
ANL-01	Ditch A	Expected to be 5-7 years	5 year reviews	1. Maintain existing fencing and access controls until remedy is complete.
ANL-01A	Main Cooling Tower Blowdown Ditch	Expected to be 5-7 years	5 year reviews	1. Maintain existing fencing and access controls until remedy is complete.
ANL-04	Sewage Lagoons	Max of 50 years expected	5 year reviews	1. Maintain existing fencing and access controls until remedy is complete. 2. Maintain water in lagoons to prevent risk to ecological receptors (burrowing mammals) until remedy is complete.
ANL-35	Industrial waste Lift Station Discharge Ditch	Expected to be 5-7 years	5 year reviews	1. Maintain existing fencing and access controls until remedy is complete.

Table H-4. Institutional Controls during DOE Operations and Post Operations under DOE Control

Restriction	Land Use Control Objectives	Controls	Controls Procedures	Surveillance to Assure Controls In-Place	Surveillance Procedures	Response to Failed Controls
Prevent Excavation on or within 50 Meters of Industrial Waste Pond, Interceptor Canal-Canal and -Mound sites (ANL-01,09,09)	Prevent current and future worker and resident exposure to radioactively-contaminated soils.	Access Restrictions include fences, and posted signs warning against excavation.	DOE Radiation Control Manual for radioactive contamination and exposure. DOE Environmental Checklist process. Security Procedures for ANL-W. ANL-W ES&H Excavation permit Procedure.	Annual inspection to ensure integrity of existing fences and signs until first 5-year review. Further inspections every 5 years until determined by 5-year review to be no longer needed.	Use 5-year Site-Specific Inspection Form in OU 9-04 Operations and Maintenance Plan	Perform maintenance to signs, permanent markers, and fencing as needed. Attach documentation of maintenance activities to 5-year Site-Specific Inspection Form. Activation of security procedures for responding to trespassing. Replace any excavated soil back into excavation.

Table H-5. Institutional Controls After DOE No Longer Controls the WAG 9 Land Area

Restriction	Land Use Control Objectives (Identified risks)	Controls	Controls Procedures	Surveillance to Assure Controls In-Place	Surveillance Procedures	Response to Failed Controls
Prevent Excavation	Prevent current and future worker and resident exposure to cesium-137 contaminated soils in the Industrial Waste Pond bottom, and the Interceptor Canal-Canal and -Mound sites. (ANL-01, 09,09)	Access restrictions (posted signs, permanent markers), legal access and development restrictions filed with Bingham County government	Controls are not required after sufficient radioactive decay of residual cesium takes place. (Estimated to be 110 years from 1999 for ANL-01 Industrial Waste Pond, 105 years for ANL-09, Interceptor. Canal-Mound, and 88 years for ANL-09 Interceptor Canal-Canal.	Five year reviews as required by NCP	Five year reviews using Site-specific Inspection Form in OU 9-04 O&M Plan.	Documentation of maintenance activities attached to five-year inspection form

4. Description of Existing Administrative and Institutional Controls Specific to WAG 9

Public access to all WAG 9 sites requiring remedial activities is currently restricted by posting and by fencing in some cases. All WAG 9 waste sites are on federal property where residential development is prohibited. Sites ANL-01A and ANL-35 are located entirely within security fencing at ANL-W. Ditches A and B of ANL-01 are also located within the security fencing. Only persons conducting official business with the Department of Energy are allowed to enter the fenced perimeter of the ANL-W site or to access the areas surrounding ANL-W. All federal and contractor employees are required to successfully complete General Employee Training prior to working at the ANL-W facility. This training addresses warning signs, barriers, and work control requirements to prevent workers from exposure to radiological and chemical contaminants at ANL-W facilities, including the WAG 9 waste sites. All workers must complete this training, whether working inside or outside the ANL-W security fence. Beginning in May of 1999, the three waste site areas with human health risks will be clearly posted to prevent risks posed by long-term occupational exposure to the radionuclide contaminants.

Employees, contractors or visitors wishing to gain access to the Industrial Waste Pond and its ditches, the Interceptor Canal, or the Sewage Lagoons are required to first check in with the Security Post (Bldg 701) and show the appropriate badge indicating that the individual has completed the required training.

5. Notification Requirements Regarding Sale or Lease Of WAG 9 Waste Sites

At any time before Remedial Action Objectives are met, DOE (or the responsible land agency) must provide written notice to the following officers before sale or lease of lands that are WAG 9 waste sites which have undergone remedial action:

Remediation Project Manager
U.S. Environmental Protection Agency Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Federal Facility Agreement Consent Order Project Manager
Idaho Department of Health and Welfare
1410 North Hilton
Boise, Idaho 83706

This written notice must specify by legal description which lands are being sold or leased, and the likely potential future use of the property. This notification requirement also applies to the sale or lease of lands that are within 50 meters of WAG 9 waste sites which have undergone remedial action.

6. Monitoring the Institutional Controls

The Department of Energy Chicago Operations Office-Argonne Group-West (DOE-CH) will be responsible for implementing, monitoring and maintaining institutional controls at WAG 9 during the remedial actions on the eight waste site areas of concern. After remediation goals (RGs) are met, the Chicago Operations Office will continue to monitor and maintain institutional controls in accordance with Table H-4 above until DOE relinquishes control of the WAG 9 lands. The responsibility to monitor and maintain institutional controls transfers to the receiving land agency in the event DOE relinquishes control of WAG 9 lands before Remedial Action Objectives (RAOs) are met.

Institutional Control monitoring reports will consist of the 5-year Inspection Forms in the OU 9-04 Operations and Maintenance Plan, together with documentation of any maintenance or repair work performed on the controls. These reports must be sent to the following Offices as part of the CERCLA 5-year review process:

Remediation Project Manager
U.S. Environmental Protection Agency Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Federal Facility Agreement Consent Order Project Manager
Idaho Department of Health and Welfare
1410 North Hilton
Boise, Idaho 83706

The Department of Energy (or responsible land agency) will also immediately report any activity that is inconsistent with the Institutional Control Objectives to the above offices. This reporting is required at any time such an activity is discovered at WAG 9.

7. Implementing the Institutional Controls

The Department of Energy Chicago Operations Office (DOE-CH) will implement the Institutional Controls for WAG 9. This will consist of providing warning signs, markers and in some cases fencing around the following areas in an arrangement as shown in Attachment H-1:

ANL-01 Industrial Waste Pond

ANL-04 Sewage Lagoons

ANL-09 Interceptor Canal –Canal and –Mound areas

DOE-CH will also file certified survey plats, legal descriptions and written legal restrictions with the Bingham County, Idaho government for each of the sites requiring long-term institutional controls (see Table H-3). This filing will be made by DOE-CH

after remediation goals are met for all sites excluding the Sewage lagoons (estimated to be between 2004 and 2006). The Sewage Lagoons will not require ICs after they undergo remedial action in 2033

Attachment H-1

**(INSERT CERTIFIED SURVEY PLATS OF INDUSTRIAL
WASTE POND, INTERCEPTOR CANAL, MOUND, and
SEWAGE LAGOON) when completed**

**SURVEY PLATS WERE NOT
APPROVED FOR PUBLIC RELEASE**